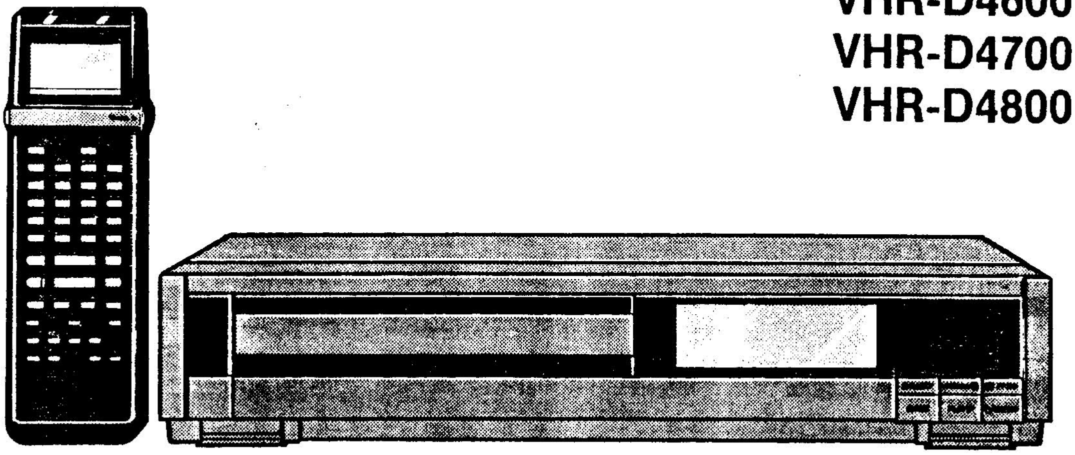
SANYO

Service Technical Information

Color Video
Cassette Recorder

VHR-4100 Series
VHR-4200 Series
VHR-4300 Series
VHR-D4400 Series
VHR-D4500 Series
VHR-D4600 Series
VHR-D4700 Series
VHR-D4800 Series



VHS PAL HQ

Basic Circuit Description

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1. OVERVIEW

This model contains a P88 mechanism which employs the full loading system. It has many salient features given below.

(1) Non-use of Dedicated Power Switch

(a) The power is automatically switched on when a tape is inserted, or the clock is set, or else a channel is adjusted.

(b) Even when the power is off with the tape loaded on, the power can be supplied to the equipment merely with the PLAY, F.F, or REWIND pushbutton, causing the equipment to start.

(c) The POWER switch also serves as a STOP button. When the STOP/POWER push button switch is pressed, the operation stops, but when it is pressed one more time, the power is turned off.

(2) Non-Use of Timer Waiting Switch

Timer waiting procedure was required on a conventional model hitherto available using the timer pushbutton switch at the end of reservation. This new model is automatically placed into the timer record waiting state if the reservation program has been put into the timer in advance.

(3) Features of Full Loading Mechanism

Hitherto, the tape was wound around the head drum only during the PLAY (RECORD) mode or the SEARCH mode of operation, but on this model, in every mode a full loading mechanism with the tape wound around the head drum is employed.

With the full loading mechanism adopted, the increased convenience of operation has significant been improved to eliminate the drawback of the VHS system.

(a) The mode shift time for quickening the time to cause an image to appear on the screen after pressing the PLAY button has been shortened to a considerable extent.

(b) When the same operating button (F.F or REWIND) is pressed during the fast forward mode or the rewind mode, an image is displayed on the screen, and the equipment is placed into the SEARCH mode for playback.

(c) The full loading mechanism dispenses with the need to add a special mechanism (such as a half-loading mechanism) and simplifies the design of the entire mechanism which hitherto made the mechanism extremely complicated and voluminous since the VISS/VASS functions and a realtime counter had to be designed in.

(d) On the new model, the high-speed VISS/VASS has now been made possible, including the quickening of the time from the detection of a VISS/VASS search signal till the display of an image on screen, and new functions such as "GO TO" for setting the playback start time.

(4) SSB System (System Control)

Using one common serial bus line, the SSB system sends and receives data at the same clock timing and on an time-sharing basis with the system between microcomputers such as the tape remaining calculation MPU the digital memory control MPU according to the functions of each model, in addition to the timer/tuning control MPU. This SSB system is designed around the system control MPU.

(a) Connection between the system control MPU and each microcomputer is made by use of one and the same clock (SCK) and one bus line (SDA) for simplification of wiring.

(b) A VTR condition can be checked by observing serial data on the SSB monitor set (Jig No. VHJ-0055) so that the cause can be easily found in the event of a trouble with a microcomputer.

(c) Mutual control of each microcomputer can be made by the common bus line, and service improvement is realized through standardization of microcomputers used on each model.

(5) Features of Video Circuit

The procedure for processing the VHS (HQ) type luminance signal and the chroma signal is unchanged as before.

(a) The luminance signal processing circuit of all models incorporates a noise canceller (including DOC offset) using a CCD 1H delay line for radical improvement on signal-to-noise ratio.

(b) The white/dark clip of the luminance signal is designed to be adjustment free.

(c) On some models having a digital memory mounted in, the digital noise reduction (DNR) circuit is provided to realize further image improvement.

(6) Features of Servo Circuit

The digital control method using the digital servo IC and the servo amplifier IC remains unchanged as in conventional systems hitherto available.

(a) The model having an ATR (auto tracking) mounted in makes use of an ATR microcomputer in the system control for more dependable automatic tracking control function through digital operation control. ATR data is sent to the digital servo IC via a system control microcomputer to execute tracking delay processing within the servo IC.

(b) The control signal DC record circuit, which is indispensable to the VISS/VASS and linear counter, is designed in the servo amplifier 1C.

This manual describes the SSB system of the control system, which represents the most outstanding feature of this equipment.

2. SSB SYSTEM

- The SSB system is the abbreviation of the Serial Bus line system.
- The SSB signal consists of two types of signal below.

  [SCK]

  The clock signal to be output from the system control MPU according to the timing chart.

  [SDA]

  This is a bidirectional serial data line for data transfer on 12 bands (8 bit, 0 – 11 blocks).
- The SSB system is designed around the system control MPU. It makes system control of data among timer/tuning control MPU, tape remaining calculation MPU, and digital memory control MPU using a common bus line at one and the same clock timing and on a time sharing basis.
- It offers the following advantages over the conventional system which individually controls the microcomputer of each circuit with the signal from the system control MPU.
  1. Makes possible model design meeting the requirements for new functions using bidirectional serial data.
  2. Mutual control between microcomputers realizes microcomputer standardization with use of a common bus line.
  3. Serial data observable enables a check on the VTR operation status.
  4. Each microcomputer is controlled by one and the same clock for definite video system control.
  5. Number of input and output terminals between the system control MPU and each microcomputer can be reduced for increased efficiency of the system control MPU terminal function.

2-1. Block Diagram of SSB System

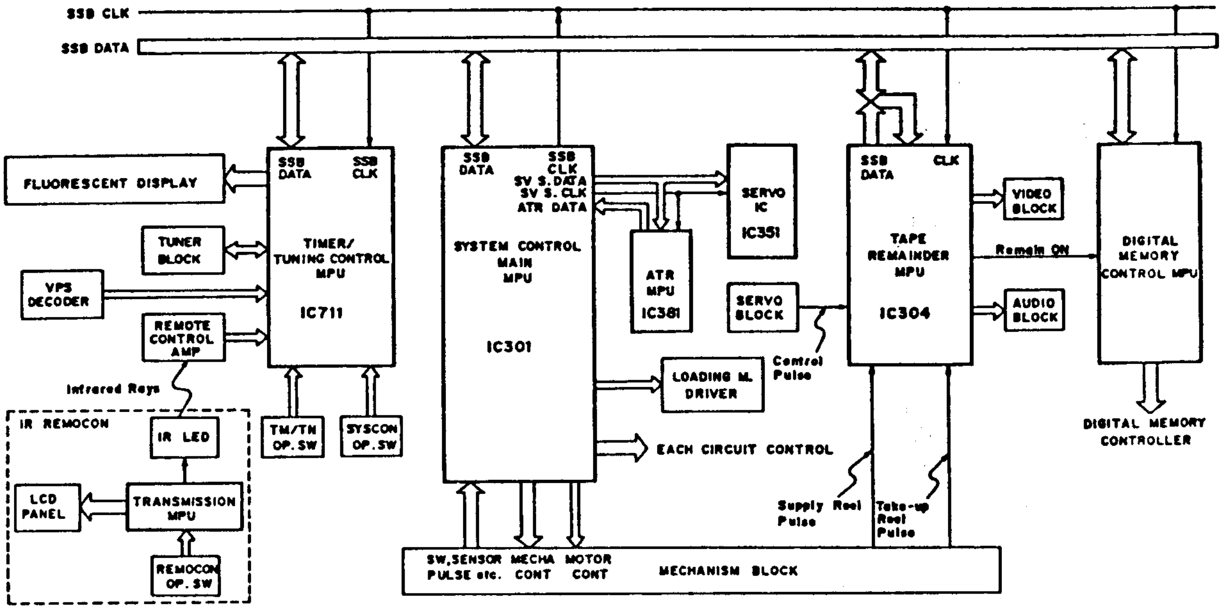

SSB CLK
SSB DATA
FLUORESCENT DISPLAY
TUNER BLOCK
VPS DECODER
REMOTE CONTROL AMP
Infrared Rays
IR REMOCON
IR LED
LCD PANEL
TRANSMISSION MPU
REMOCON OP. SW
SSB DATA
SSB CLK
TIMER/ TUNING CONTROL MPU
IC711
TM/TN OP. SW
SYSCON OP. SW
SSB DATA
SSB CLK
SV S. DATA
SV S. CLK
ATR DATA
SYSTEM CONTROL MAIN MPU
IC301
ATR MPU
IC381
SERVO IC
IC351
SERVO BLOCK
Control Pulse
LOADING M. DRIVER
EACH CIRCUIT CONTROL
SSB DATA
CLK
TAPE REMAINDER MPU
IC304
VIDEO BLOCK
AUDIO BLOCK
Remain ON
DIGITAL MEMORY CONTROL MPU
DIGITAL MEMORY CONTROLLER
Supply Reel Pulse
Take-up Reel Pulse
SW, SENSOR PULSE etc.
MECHA CONT
MOTOR CONT
MECHANISM BLOCK

Fig. 2-1-1. SSB System Block Diagram

2-2. Clock Data Timing for SSB System

2-2-1. SSB Data Cycle

- The SSB system forms one data cycle with twelve blocks of bytes 0 – 11.

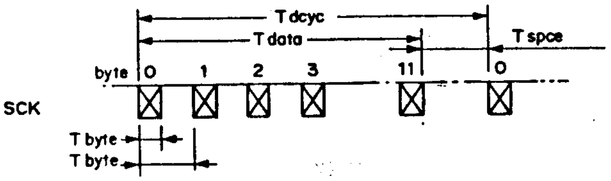

Tdcyc
T data
T spce
byte
0
1
2
3
11
0
SCK
T byte
T byte

Fig. 2-2-1

2-2-2. Byte (Block) Cycle

- Each block consists of one byte cycle of 8 bits 0 – 7.

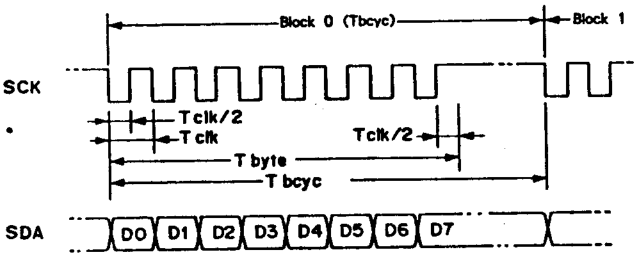

Block 0 (Tbcyc)
Block 1
SCK
Tclk/2
T clk
Tclk/2
T byte
T bcyc
SDA
D0
D1
D2
D3
D4
D5
D6
D7

Fig. 2-2-2

2-2-3. Clock (Bit) Cycle

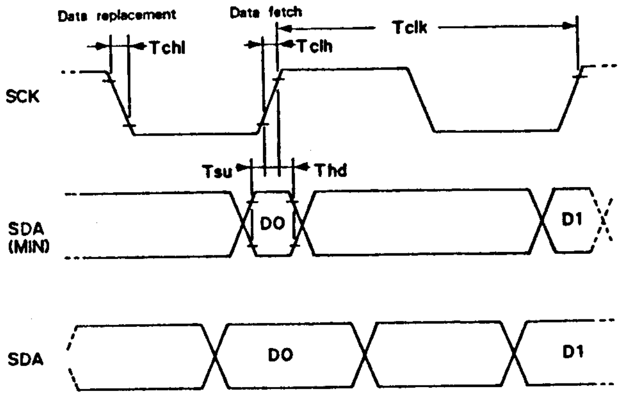

Data replacement
Data fetch
Tclk
Tchl
Tclh
SCK
Tsu
Thd
SDA (MIN)
D0
D1
SDA
D0
D1

Fig. 2-2-3

2-2-4. SSB Timing Characteristics

Characteristic	Symbol	MAX	TYP	MIN	Unit
Data Cycle Time	Tdcyc	16.896	15.360	13.824	ms
Data Area Width	Tdata	12.531	11.392	10.253	ms
Byte Width	Tbyte	281.6	128	115.2	μ s
Byte Cycle Time	Tbcyc	1126.4	1024	921.6	μ s
Clock-pulse Cycle Time	Tclk	35.2	16	14.4	μ s
Clock-pulse Rise Time	Tclh	3	–	–	μ s
Clock-pulse Fall Time	Tchl	3	–	–	μ s
Data Setup Time	Tsu	–	–	1	μ s
Data Hold Time	Thd	–	–	1	μ s
Data Space Width	Tspce	–	–	3.571	ms

Table 2-2-1

(5) Data Signal of each Blocks 0 – 11

SSB DATA BLOCK NO.	BLOCK 0								BLOCK 1							
SOURCE	GENERALLY TIMER/TUNING CONTROL MPU								SYSTEM CONTROL MPU							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	KEY								MODE					MODE TRANS	HOLD	POWER ON
	0	1	2	3	4	5	6	7	0	1	2	3	4			
REF. ITEM	D3~0 (0~F)				D7~4 (0~F)				OPERATION MODE							

SSB DATA BLOCK NO.	BLOCK 2								BLOCK 3							
SOURCE	SYSTEM CONTROL MPU								TIMER/TUNING CONTROL MPU							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	PB/REC SPEED		CTL PULSE LACK	E. P SW	S-VHS MODE	DEW	PLAY BACK	TIMER CANCEL	TIMER PRO-GRAM	QSR	EXEC TIME	PRO-GRAM MODE	OSD ON	VCR/$\overline{\text{TV}}$	S-VHS SW	TAPE T-160 SW
	0	1														
REF. ITEM	EP, LP, SP						TAPE BEGIN/END	CAUTION FLASH	D0-D2 timer status selection							

SSB DATA BLOCK NO.	BLOCK 4								BLOCK 5							
SOURCE	EACH MPU COMMON								EACH MPU COMMON							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	USE 10KEY	DATA SOURCE A			DATA SOURCE B		GRAPHIC SOURCE		DISP DATA A				GRAPHIC DATA			
		0	1	2	0	1	0	1	A0	A1	A2	A3	0	1	2	3
REF. ITEM		FLD upper stage display MPU selection			FLD lower stage display MPU selection		FLD upper stage TRACKING display		FLD upper stage display DATA				FLD upper stage TRACKING display DATA			

SSB DATA BLOCK NO.	BLOCK 6								BLOCK 7							
SOURCE	EACH MPU COMMON								TIMER/TUNING CONTROL MPU							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	DISP DATA B								CH				STATION	TUNE PRO-CESS		PRESET
	0	1	2	3	4	5	6	7	0	1	2	3				
REF. ITEM	FLD lower stage display DATA								CHANNEL selection							

SSB DATA BLOCK NO.	BLOCK 8								BLOCK 9							
SOURCE	TIMER/TUNING CONTROL MPU								D/M COTROL MPU AND SYSTEM CONTROL MPU							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	INPUT SELECT SW		AUDIO OUT SELECT SW		EXT1/EXT2 SW	MIX PB SW			D/M MODE					DNR	POSITION INIT	MEMORY INHIBIT
	0	1	2	3					0	1	2	3	4			
REF. ITEM																

SSB DATA BLOCK NO.	BLOCK 10								BLOCK 11							
SOURCE	BLANK								BLANK							
BIT NO.	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
SIGNAL NAME	BLANK								FREE AREA							
REF. ITEM																

Table 2-2-2

2-3. BLOCK 0

This block represents the operating key data signal. This is mainly output from the TIMER/TUNING CONTROL MPU.
But on multi-function models, the key operating signal may sometimes be fed from other microcomputer.

2-3-1. Key 0 – 7

(1) The microcomputer which outputs KEY 0 – 7 does this output operation while making arbitration (*) shown below.

• When KEY data is output, enter the data at that time, but if the data fails to agree with the previously output data even once, "NO KEY" signal is output when the next block 0 has come, thereby indicating that the KEY data output was not possible. In this case, the KEY output is not made.

[Arbitration algorithm]

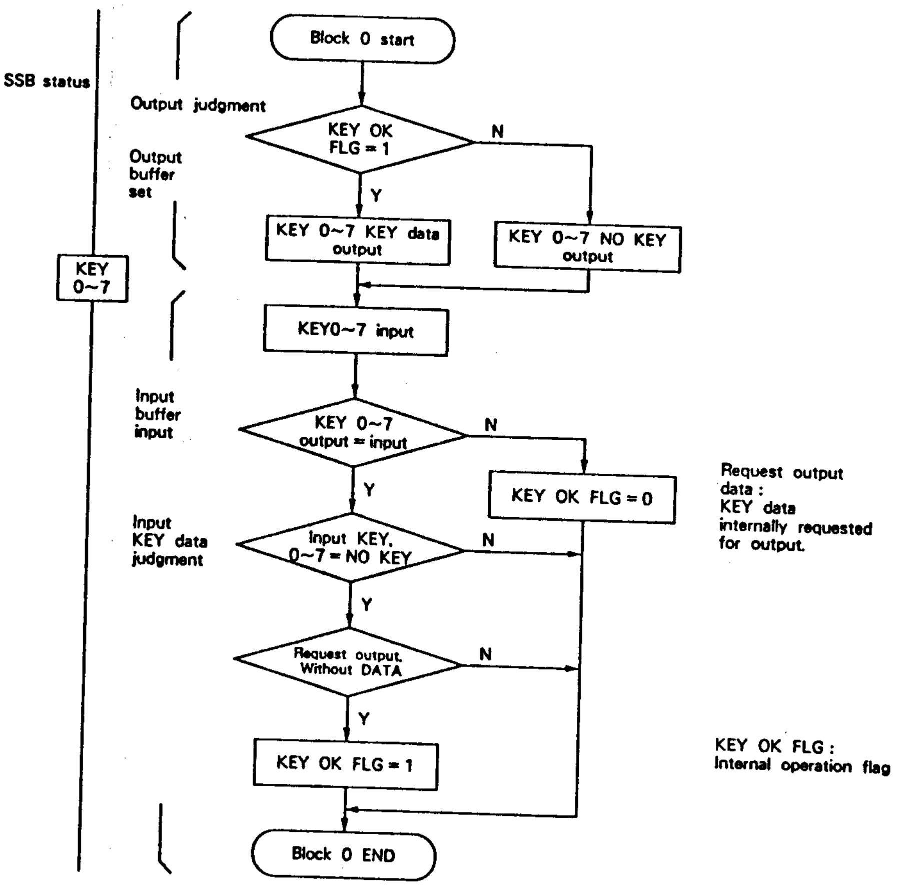

SSB status
KEY 0~7
Output judgment
Output buffer set
Input buffer input
Input KEY data judgment
Block 0 start
KEY OK FLG = 1
N
Y
KEY 0~7 KEY data output
KEY 0~7 NO KEY output
KEY0~7 input
KEY 0~7 output = input
N
Y
KEY OK FLG = 0
Input KEY, 0~7 = NO KEY
N
Y
Request output, Without DATA
N
Y
KEY OK FLG = 1
Block 0 END
Request output data : KEY data internally requested for output.
KEY OK FLG : Internal operation flag

Fig. 2-3-1

Note * : Arbitration

The term "arbitration" refers an arbitrating action. That is, when data is entered simultaneously from two or more different microcomputers, the data bus is once placed into the initial state to avoid disorder of signal contents for acceptance of new data entry.
In other words, when data A is sent to the data bus from the microcomputer A, and data B is sent out of the microcomputer B at the same time, data A and B are made invalid with the data bus changed into data C (NO KEY).

(The microcomputer A sends data A out and fetches the data A once again in the microcomputer A. It then compares the contents, and if the contents are same, data is sent out to data bus directly, but if contents differ (that is, data A exists together with data B), data A and data B are made invalid. But it becomes valid when data B has been sent out upon recognition of data A.)

(2) The microcomputer which inputs KEY 0 – 7 verifies the coincidence of input data twice and takes it as confirmed data. If data differing from that currently confirmed is entered twice consecutively, the verifying KEY is judged to have been released. For further details, refer to the example of operation below.

- Example of KEY Entry and Release Operation

– B – A – A – A – C – A – A – B – C – D – D – D –

Verifying KEY data |—— A KEY ——| NO KEY |— D KEY

(3) KEY depression (front SW and remote control SW) has to be made at least three times, and data can be output while each key is being held.

(4) The KEY code which is automatically sent out by the microcomputer should be output at least five times.

(5) Front KEY takes precedence over the remote control KEY.

(6) KEY data (D0 – D7) with bits 0 – 7 is shown below.

KEY data is in combination of the first half 4 bits of D3-0 and the last half 4 bits of D7-4 as given in the table below.

	D3~0 0	D3~0 1	D3~0 2	D3~0 3	D3~0 4	D3~0 5	D3~0 6	D3~0 7	D3~0 8	D3~0 9	D3~0 A	D3~0 B	D3~0 C	D3~0 D	D3~0 E	D3~0 F
D7~4 0	KE RELEASE	CH UP	CH DOWN	AUDIO SELECT	1/ POS 1	2/ POS 2	3/ POS 3	4/ POS 4	VCR/ TV	VOL UP	VOL DOWN	QUICK	5/ POS 5	6/ POS 6	7/ POS 7	8/ POS 8
D7~4 1	STOP	PAUSE /STILL	REW	FF	PLAY	REC	REW PLAY	F • ADV	REVERSE PLAY	SERCH	SLOW	1/5 SLOW	9/ POS 9	0/ POS 10	AV	AUTO TRACK
D7~4 2																
D7~4 3																
D7~4 4	POS 11	POS 12	MEMORY CALL	COUNT. MEMORY	COUNT. RESET	C • DISPLAY	RECALL /PROG.	MODE +	MODE –		CANCEL	OK	OSD DISP.	TRACKING +	TRACKING –	VPS
D7~4 5	SPECIAL	PIP	INSERT	MEMORY STILL	MARK		MEMORY ROCK	MULTI STROBE	ZOOM	ART	STROBE	DICIT. RELEAS	CH SCAN	PRE MULTI	TAPE SPEED	DNR
D7~4 6																
D7~4 7																
D7~4 8	EJECT	A.DUB	REW EJECT	REW REC	CLOCK SET						S – VHS AUT/ MN					
D7~4 9					POS 13	POS 14	POS 15	POS 16	BAND	MEMORY (CH)	TUNING UP	TUNING DOWN	FT UP	FT DOWN	PRESET	
D7~4 A																
D7~4 B																
D7~4 C			T.REC PAUSE						VISS	VASS	GO TO	SET ON	SET OFF	SP	LP	EP
D7~4 D	SPECIAL 0	SPECIAL 1	SPECIAL 2	SPECIAL 3	SPECIAL 4	SPECIAL 5	SPECIAL 6	SPECIAL 7	SPECIAL 8	SPECIAL 9	SPECIAL 10	SPECIAL 11	SPECIAL 12	SPECIAL 13	SPECIAL 14	SPECIAL 15
D7~4 E																
D7~4 F																NO KEY

Table 2-3-1

2-4. BLOCK 1

This is the VTR operation mode data signal. The signal is output from the system control MPU.

2-4-1. Mode 0 – 4

1. This block in combination with HOLD (D6) indicates the MODE status of the system.
2. When the MODE changes, its destination MODE is indicated.
3. The display corresponding to button input is indicated.
4. Special MODES

- TIMER STAND-BY

When a shift is made to POWER OFF with bit 0 (TIMER PROGRAM) of block 3 "L" level and bit 2 (EXEC TIME) "H" level, and also with the system control ready for recording, the system control is placed into the TIMER STAND-BY mode, and the "TIMER STAND-BY" is output to MODE 0 – 4.

The TIMER microcomputer verifies this mode and causes the TIMER mark to light.

Bit Mode	MODE 4 D4	MODE 3 D3	MODE 2 D2	MODE 1 D1	MODE 0 D0
CST OUT	H	H	H	H	H
A.DUB PAUSE	H	H	H	H	L
REW	H	H	H	L	H
FF	H	H	H	L	L
FRAME ADVANCE	H	H	L	H	H
STILL	H	H	L	H	L
REC PAUSE	H	H	L	L	H
REC	H	H	L	L	L
PLAY	H	L	H	H	H
CUE	H	L	H	H	L
REVIEW	H	L	H	L	H
SLOW	H	L	H	L	L
QUICK (× 2S)	H	L	L	H	H
A.DUB	H	L	L	H	L
STAND – BY	H	L	L	L	H
STOP	H	L	L	L	L
TIMER STAND – BY	L	H	H	H	H
CST OUT TM ST – BY	L	H	H	H	L
REW SEARCH	L	H	H	L	H
FF SEARCH	L	H	H	L	L
VIDEO INSERT	L	H	L	H	H
VIDEO INSERT PAUSE	L	H	L	H	L
TIMER REC PAUSE	L	H	L	L	H
TIMER REC	L	H	L	L	L
	L	L	H	H	H
HIGH SPEED CUE	L	L	H	H	L
HIGH SPEED REVIEW	L	L	H	L	H
REW EJECT	L	L	H	L	L
REW PLAY	L	L	L	H	H
REW REC	L	L	L	H	L
	L	L	L	L	H
INITIAL	L	L	L	L	L

Table 2-4-1

- TIMER REC

1. System control shifts to the TIMER REC mode and causes the "Timer REC" to be output to Mode 0 – 4 when EXEC TIME "L" of bit 2 of block 3 is entered from the TIMER STAND-BY above. (TIMER REC start.)
2. System control shifts to the TIMER REC mode without going through POWER OFF when the POWER SW is entered from KEY 0 – 7 of block 0 during an entry of EXEC TIME "L" of bit 2 of block 3 and causes "TIMER REC" to be output to MODE 0 – 4. (Timer REC is enabled upon pressing the POWER KEY after going into the TIMER REC reservation time.)

- TIMER REC PAUSE

System control shifts to the TIMER REC PAUSE mode and outputs "TIMER REC PAUSE" to MODE 0 – 4 when the "TIMER REC PAUSE" KEY is entered from KEY 0 – 7 of block 0 in the above TIMER REC mode.

But when the "PAUSE KEY" is entered from KEY 0 – 7 in the TIMER REC mode, the system control shifts to the REC PAUSE MODE and outputs "REC PAUSE" to MODE 0 – 4.

2-4-2. MODE TRANS (*)

- The MODE change at the time of a MODE shift is indicated.

	MD. TRS (D5)
STLD OR PAUSE MODE	H
PROCESS OF MODE	L

*This data may or may not be used depending upon the model.

Table 2-4-2

2-4-3. HOLD

- In case where a MODE change is being made, the transition state is indicated.
- This is used in combination with Mode 0 − 4.
- Method of Judging the Tape IN/OUT

TAPE OUT : FUNC. 0 − 4 = CASSETE OUT
POWER ON/OFF (*)
TAPE IN : Besides above

	HOLD D6
SETTLED MODE	H
PROCESS OF MODE	L

Table 2-4-3

*System control causes the corresponding Mode 0 − 4 = CASSETTE OUT POWER ON to be sent out upon reception of the EJECT key.

2-4-4. POWER ON

The set's power status is indicated.

	PWR ON D7
POWER OFF	H
POWER ON	L

Table 2-4-4

2-5. BLOCK 2

This is a data signal for operation tape speed status, CTL signal presence or absence, E.P erase prevention switch status, DEW status, playback status, tape end cancel during the TIMER REC mode of operation, etc. This signal is output from the system control MPU.

2-5-1. PB/REC SPEED 0, 1

- This indicates the PB and REC TAPE SPEED.
- When it is desired to erase the display of the TAPE SPEED (when erasing the TAPE SPEED display in the case of 1 speed model and with the POWER OFF), "H, H" (display OFF) is output.

	SPD1 D1	SPD0 D0
Display OFF	H	H
SP	H	L
LP	L	H
EP	L	L

Table 2-5-1

2-5-2. CONTROL PULSE LACK

- When the CONTROL PULSE is absent for 0.5 second or longer, the level changes to "L".
- When CONTROL PULSE LACK = "L", BLUE BACK ON is made.

	CTL L D2
CTL PULSE EXIST	H
CTL PULSE LACK	L

Table 2-5-2

2-5-3. E.P SW

- The status of erase prevention tab for the inserted cassette is indicated.

	E P SW D3
NO E P TAB	H
KEEP E P TAB	L

Table 2-5-3

2-5-4. S-VHS MODE

- In the REC MODE, the result of judgment is output depending upon the status of front S-VHS SW (block3 D6) and S-VHS SW of the cassette.
- In the PLAY mode, the result of judgment made by the video circuit is output.

	S MODE D4
NORMAL VHS MODE	H
S − VHS MODE	L

Table 2-5-4

2-5-5. DEW

- The dew status is indicated.

	DEW D5
NO DEW	H
DEW	L

Table 2-5-5

2-5-6. PLAY BACK (TAPE BEGIN/END)

- "L" level when the PLAY BACK display is being shown on screen.
- "H" level in the EE mode.

	PB D6
EE	H
PLAY BACK	L

Table 2-5-6

*This data may be used as TAPE BEGIN/END on some models.

2-5-7. TIMER CANCEL (CAUTION FLASH)

- The timer reservation is cancelled by making the voltage level "L" in the TIMER REC mode of operation. (This is output when the tape end comes during the TIMER REC mode of operation.)

	T. CANS D7
NO CANCEL	H
TIMER CANCEL	L

Table 2-5-7

*This data may be used as "CAUTION FLASH" on some models.

2-6. BLOCK 3

This is a data signal for timer program status, on screen status, TV/VTR switchover status, S-VHS switch status, tape type for calculation of remaining tape length, etc. This is output from the TIMER/TUNING CONTROL MPU.

2-6-1. TIMER PROGRAM

- The level is made "L" when there is one or more TIMER reservation or QSR reservation.

	T. PRG. D0
NO TIMER PROGRAM	H
EXIST TIMER PROGRAM	L

Table 2-6-1

2-6-2. QSR

- The level is made "L" during QSR reservation, QSR waiting, and QSR execution.

	QSR D1
NO QSR PROGRAM	H
EXIST QSR PROGRAM	L

Table 2-6-2

2-6-3. EXEC TIME

- The level is made "L" when the current time is within either QSR or TIMER reservation time.

	XEQ T. D2
WAITING TIME	H
EXECUTE TIME	L

Table 2-6-3

< Supplement >

Identification of TIMER status based on 3 bit information of TIMER PROGRAM, QSR and EXEC TIME.

	EXEC T D2	QSR D1	T.PRG. D0
Without reservation of timer QSR	H	H	H
With timer wating time	H	H	L
During QSR reservation	H	L	H
Within QSR waiting time	H	L	L
-	L	H	H
Within timer execution time	L	H	H
-	L	L	H
Within QSR execution time	L	L	L

Table 2-6-4

2-6-4. PROGRAMING MODE

- The level is made "L" during TIMER reservation entry, including confirmation, correction, and time setting.

	PRG. MO D3
NOT PROGRAMING	H
PROGRAMING	L

Table 2-6-5

2-6-5. OSD ON

- The level is made "L" when ON SCREEN characters are appearing on the screen. (This includes the blue back status.)

	OSD ON D4
OSD OFF	H
OSD ON	L

Table 2-6-6

2-6-6. VCR/TV (TV MODE)

- VCR/TV switchover control signal.

	ANT/V D5
VCR	H
TV	L

Table 2-6-7

2-6-7. S-VHS SW

- This sends data of front S-VHS SW out.

	S-V SW D6
NORMAL VHS	H
S-VHS	L

Table 2-6-8

2-6-8. TAPE T-160 SW (NTSC Model Only)

- This is used for calculating the remaining tape length.

	T－L SW D7
~T120	H
T160	L

Table 2-6-9

2-7. BLOCK 4

This is the 10key operation mode status and the selection data of the data sending MPU for FLD display of the VTR. It is relevent for all MPUs depending on the mode. Displayed data signals, however, are sent by blocks 5 and 6.

2-7-1. USE 10-KEY

- Microcomputers other than the TIMER's cause "L" to be output to this bit when it has been placed into the MODE in which data is entered by using 10-KEY.
- The TIMER microcomputer does not cause data of CH No., etc. to be changed by using 10-KEY if this bit is "L".

	USE 10 D0
DON'T USE	H
USING	L

Table 2-7-1

2-7-2. DATA SOURCE A 0-2

- This is used for selection of the MPU that sends data of DISP DATA A 0-3.

Data Sending Microcomputer	DSA 2 D3	DSA 1 D2	DSA 0 D1
SYSCON	H	H	H
VISS/VASS	H	H	L
TAPE REMAINDER	H	L	H
————	H	L	L
————	L	H	H
————	L	H	L
————	L	L	H
CHANGE	L	L	L

Table 2-7-2

2-7-3. DATA SOURCE B 0-1

- This is used for selection of the MPU that sends data of DISP DATA B 0-3.

Data Sending Microcomputer	DSB 1 D5	DSB 0 D4
SYSCON	H	H
TAPE REMAINDER	H	L
————	L	H
CHANGE	L	L

Table 2-7-3

2-7-4. GRAPHIC SOURCE 0-1

This is used for selection of the MPU that sends data of GRAPHIC DATA 0-3 out.

Data Sending Microcomputer	GS 1 D7	GS 0 D6
SYSCON	H	H
ELECTRIC VOLUME	H	L
————	L	H
CHANGE	L	L

Table 2-7-4

[DISP DATA A]
FLD upper stage section display data.

[DISP DATA B]
FLD lower stage section display data.

[GRAPHIC DATA]
FLD upper stage section display data. Display is made by switching over with DISP DATA A.(Mainly TRACKING data display.)

[CHANGE Code Processing]
The microcomputer (TIMER microcomputer) now displaying data is established the display (FLD and OSD) according to the DATA before the CHANGE during the CHANGE code entry (one - time coincidence.)

2-8. BLOCK 5

This block is an FLD upper stage display data signal. 4 bits of D0 – D3 are VISS/VASS allied data, and other 4 bits of D4 – D7 are TRACKING graphic display data. The VISS/VASS and TRACKING can never be displayed simultaneously as they are switched over between them.

2-8-1. DISP DATA A 0 – 3 (D0 – D3)

- Data for DISPLAY of VISS and VASS, etc is sent out.
- At the time of entry
  - i) 8th time without header is ignored.
  - ii) The latter takes the precedence if there is a header in between.
- DISP DATA A is established with seven times of SSB data cycles as a complete cycle.

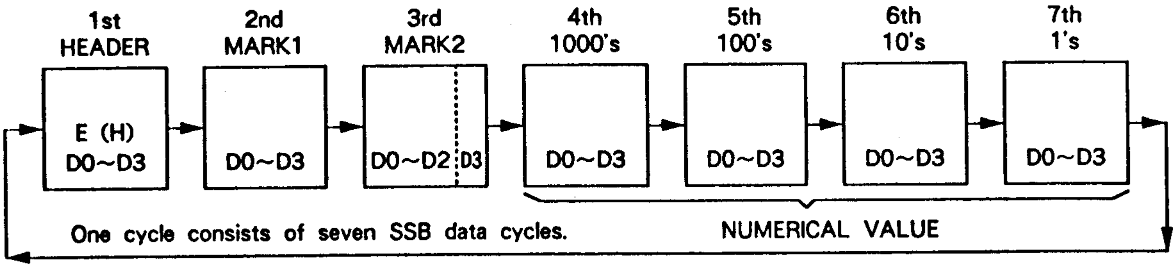

1st
HEADER
2nd
MARK1
3rd
MARK2
4th
1000's
5th
100's
6th
10's
7th
1's
E (H)
D0~D3
D0~D3
D0~D2
D3
D0~D3
D0~D3
D0~D3
D0~D3
One cycle consists of seven SSB data cycles.
NUMERICAL VALUE

Fig. 2-8-1

- D3 bit of MARK2 indicates MEMORY ON/OFF.
  ON – "L" OFF – "H"

MARK1	MARK2		NUMERICAL VALUE	D3	D2	D1	D0
MARK BLANK	D3	D2~D0	BLANK	H	H	H	H
HEADER			HEADER	H	H	H	L
COUNTER GO – TO			S	H	H	L	H
INDEX			P	H	H	L	L
ADDRESS			C	H	L	H	H
MARK			–	H	L	H	L
ERASE			9	H	L	L	H
CALL		See separate figure attached.	8	H	L	L	L
RENUMBER	MEMORY		7	L	H	H	H
REPEAT			6	L	H	H	L
TAPE SELECT			5	L	H	L	H
TRACKING			4	L	H	L	L
SPECIAL			3	L	L	H	H
			2	L	L	H	L
			1	L	L	L	H
			0	L	L	L	L

Table 2-8-1

- Contents of 2nd MARK2 data corresponding to 1st MARK1 data.

MARK1	MARK2	D2	D1	D0	MARK1	MARK2	D2	D1	D0
MARK BLANK	MARK BLANK	H	H	H	CALL		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
	MARK BLANK	H	L	H			H	L	H
	MARK BLANK	H	L	L			H	L	L
	MARK BLANK	L	H	H			L	H	H
	MARK BLANK	L	H	L			L	H	L
	MARK BLANK	L	L	H		FLT and OSD	L	L	H
	MARK BLANK	L	L	L		FLT	L	L	L
COUNTER GO-TO		H	H	H	RENUMBER		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
		H	L	H			H	L	H
		H	L	L			H	L	L
	FIND	L	H	H			L	H	H
	SCAN	L	H	L			L	H	L
	STAND BY SET	L	L	H		MARK	L	L	H
	STAND BY	L	L	L		SCAN	L	L	L
INDEX		H	H	H	REPEAT		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
		H	L	H			H	L	H
	MEMORY HOLD	H	L	L			H	L	L
	FIND	L	H	H			L	H	H
	SCAN	L	H	L			L	H	L
	STAND BY SET	L	L	H		OPERATE	L	L	H
	STAND BY	L	L	L		STAND BY	L	L	L
ADDRESS		H	H	H	TAPE SELECT		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
	LINEAR TIME ADDRESS	H	L	H			H	L	H
		H	L	L			H	L	L
	FIND	L	H	H			L	H	H
	SCAN	L	H	L			L	H	L
	STAND BY SET	L	L	H			L	L	H
	STAND BY	L	L	L			L	L	L
MARK		H	H	H	TRACKING		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
		H	L	H			H	L	H
		H	L	L			H	L	L
		L	H	H			L	H	H
		L	H	L			L	H	L
	VASS	L	L	H			L	L	H
	VISS	L	L	L			L	L	L
ERASE		H	H	H	SPECIAL		H	H	H
	HEADER	H	H	L		HEADER	H	H	L
		H	L	H			H	L	H
		H	L	L			H	L	L
		L	H	H			L	H	H
		L	H	L			L	H	L
	ERASE	L	L	H			L	L	H
	SCAN	L	L	L			L	L	L

Table 2-8-2

2-8-2. GRAPHIC DATA 0 – 3 (D4 – D7)

- Data for GRAPHICS is sent out.
- At the time of entry
  - i) 5th time without header is ignored.
  - ii) If a header exists in between, the latter one takes precedence.
- GRAPHIC DATA is established with six SSB data cycles as one cycle.

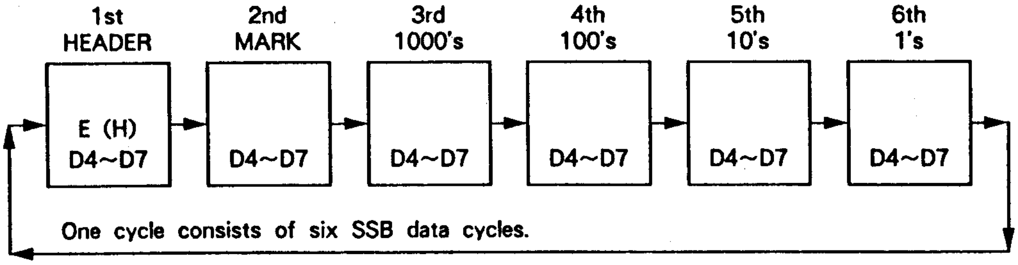

1st
HEADER
2nd
MARK
3rd
1000's
4th
100's
5th
10's
6th
1's
E (H)
D4~D7
D4~D7
D4~D7
D4~D7
D4~D7
D4~D7
One cycle consists of six SSB data cycles.

Fig. 2-8-2

MARK	NUMERICAL VALUE	D7	D6	D5	D4
	BLANK	H	H	H	H
HEADER	HEADER	H	H	H	L
	S	H	H	L	H
	P	H	H	L	L
	C	H	L	H	H
	–	H	L	H	L
	9	H	L	L	H
	8	H	L	L	L
	7	L	H	H	H
	6	L	H	H	L
	5	L	H	L	H
ELECTRIC VOLUME	4	L	H	L	L
VARIABLE SLOW	3	L	L	H	H
INDEX REVERCE	2	L	L	H	L
INDEX FORWARD	1	L	L	L	H
TRACKING	0	L	L	L	L

Table 2-8-3

2-9. BLOCK 6

This block is a signal for FLD lower stage display linear tape counter data and tape remaining length data (on models with the TAPE REMAIN function only).

2-9-1. DISP DATA B 0－7

- This block sends out linear counter data and TAPE REMAIN data.
- DISP DATA B is established with three times of SSB data cycle as a cycle.
- At the time of entry
  - i) 4th time without header is ignored.
  - ii) If there is a header in between, the latter takes the precedence.

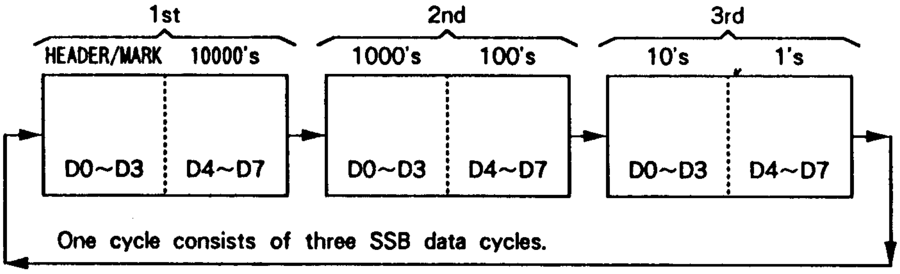

1st
2nd
3rd
HEADER/MARK
10000's
1000's
100's
10's
1's
D0～D3
D4～D7
D0～D3
D4～D7
D0～D3
D4～D7
One cycle consists of three SSB data cycles.

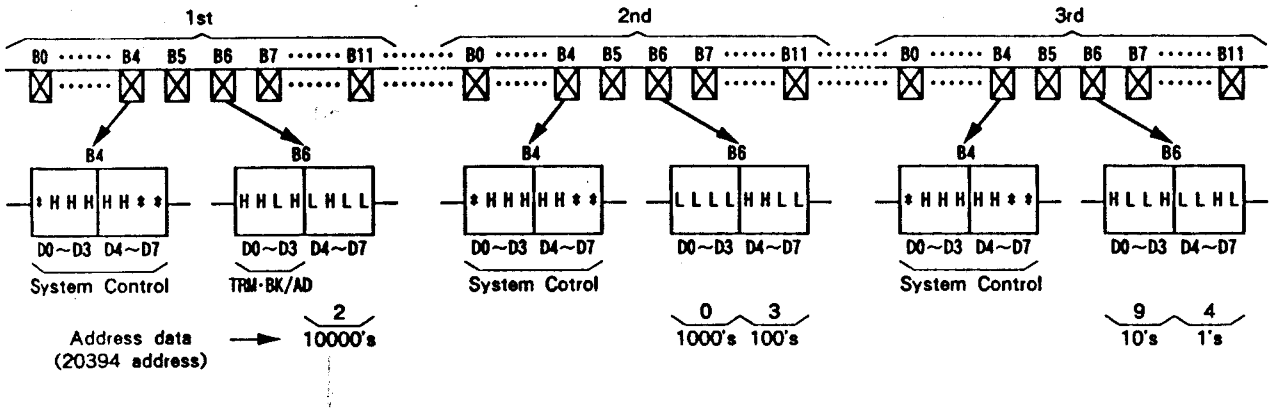
Fig. 2-9-1

DISP DATA B 0～3	DISP DATA B 4～7	D7 D3	D6 D2	D5 D1	D4 D0
BLANK	BLANK	H	H	H	H
HEADER/TRM・ON	F	H	H	H	L
HEADER/CNTER＋	S	H	H	L	H
HEADER/CNTER－	P	H	H	L	L
HEADER/TRM・BK/AD	C	H	L	H	H
－	－	H	L	H	L
9	9	H	L	L	H
8	8	H	L	L	L
7	7	L	H	H	H
6	6	L	H	H	L
5	5	L	H	L	H
4	4	L	H	L	L
3	3	L	L	H	H
2	2	L	L	H	L
1	1	L	L	L	H
0	0	L	L	L	L

Table 2-9-1

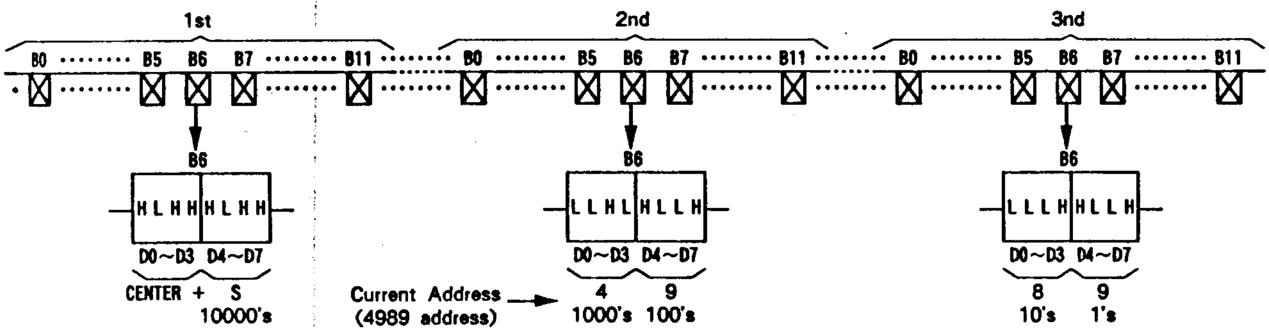
< Example of Application >

① If DATA SOURCE is SYSCON with HEADER/TRM • BK/AD, ADDRESS is sent out.



1st
2nd
3rd
B0 ······ B4 B5 B6 B7 ······ B11
B4
B6
* H H H H H * *
H H L H L H L L
L L L L H H L L
H L L H L L H L
D0~D3 D4~D7
System Control
TRM·BK/AD
System Cotrol
2
10000's
0
3
1000's
100's
9
4
10's
1's
Address data
(20394 address)

②When 10000's is "S" with CNTER +, the current ADDRESS is sent out.



1st
2nd
3nd
B0 ········ B5 B6 B7 ········ B11
B6
H L H H H L H H
L L H L H L L H
L L L H H L L H
D0~D3 D4~D7
CENTER +
S
10000's
Current Address
(4989 address)
4
9
1000's
100's
8
9
10's
1's

Fig. 2-9-2

2-10. BLOCK 7

This block is a data signal for selected channel data, channel selection status, and during channel selection time or channel non-selection time. This signal is output from the TIMER/TUNING CONTROL MPU.

2-10-1. CH 0 – 3

- Data is established with four times of CHANNEL data as one cycle.
- At the time of entry
  - i) 5th time without header is ignored.
  - ii) If there is a header in between, the latter takes the precedence.

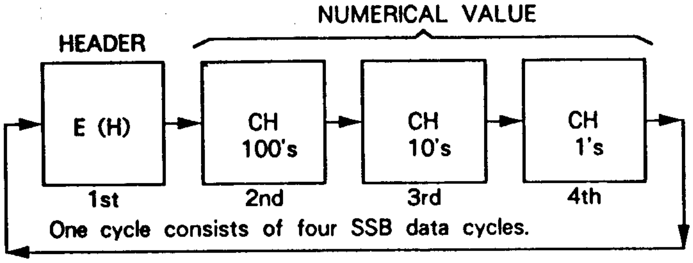

NUMERICAL VALUE
HEADER
E (H)
CH 100's
CH 10's
CH 1's
1st
2nd
3rd
4th
One cycle consists of four SSB data cycles.

Fig. 2-10-1

HEADER	NUMERICAL VALUE	D3	D2	D1	D0
	BLANK	H	H	H	H
HEADER	HEADER	H	H	H	L
	S	H	H	L	H
	P (*)	H	H	L	L
	C	H	L	H	H
	–	H	L	H	L
	9	H	L	L	H
	8	H	L	L	L
	7	L	H	H	H
	6	L	H	H	L
	5	L	H	L	H
	4	L	H	L	L
	3	L	L	H	H
	2	L	L	H	L
	1	L	L	L	H
	0	L	L	L	L

* CH 100's indicates "BS" when "P" on some models.

Table 2-10-1

2-10-2. STATION, TUNE PROCESS

- Selection status of CHANNEL No. of CH 0 – 3 is indicated.

	TU. PRC D5	STATI. D4
TUNE END, BUT NO STATION	H	H
TUNE STATION COMPLETLY	H	L
TUNING PROCESS	L	H
DON'T CARE	L	L

Table 2-10-2

2-10-3. PRESET

	D7
NORMAL	H
PRESET	L

Table 2-10-3

2-11. BLOCK 8

2-11-1. INPUT SELECT SW 0, 1

- Switching control data acquired by using the INPUT SELECT SW.

	IN. S1 D1	IN. S0 D0
TU	H	H
S.C	H	L
EXT	L	H
–	L	L

Table 2-11-1

2-11-2. AUDIO OUT SELECT SW 0, 1

- Switching control data acquired by using the AUDIO OUT SELECT SW.

	A. O. S1 D3	A. O. S2 D2
STEREO	H	H
L/MAIN	H	L
R/SUB	L	H
NORMAL	L	L

Table 2-11-2

2-11-3. EXT1/EX2 SW

- Switching control data acquired by using the EXT1/EXT2 SW.

	EX1/2S D4
EXT1	H
EXT2	L

Table 2-11-3

2-11-4. MIX PB SW

- Switching control data acquired by using the MIX PB SW.

	MIX SW D5
MIX OFF	H
MIX ON	L

Table 2-11-4

2-12. BLOCK 9

This block is a operation mode data signal for Digital memory. This signal is output from the digital memory control MPU. The block 9 is used on models with the Digital memory function only.

2-12-1. D/M MODE 0 – 4

This block indicates the operation mode of digital memory.

PIP (α, β) indicates a picture-in-picture with the parent screen as α and the child screen as β.

	D. MOD4 D4	D. MOD3 D3	D. MOD2 D2	D. MOD1 D1	D. MOD0 D0
DON'T USE MEMORY	H	H	H	H	H
PIP (EE, EXT)	H	H	H	H	L
PIP (EE, PB)	H	H	H	L	H
PIP (EE, STL)	H	H	H	L	L
PIP (EE, CUE)	H	H	L	H	H
PIP (EE, RVW)	H	H	L	H	L
PIP (PB, EE) α β	H	H	L	L	H
PIP (PB, EXT) (Parent, Child)	H	H	L	L	L
PIP (EXT, EE)	H	L	H	H	H
PIP (EXT, PB)	H	L	H	H	L
PIP (EXT, STL)	H	L	H	L	H
PIP (EXT, CUE)	H	L	H	L	L
PIP (EXT, RVW)	H	L	L	H	H
	H	L	L	H	L
	H	L	L	L	H
MRY STL (TV)	H	L	L	L	L
MRY STL (PLAY)	L	H	H	H	H
MS (AUTO)	L	H	H	H	L
MS (MANUAL)	L	H	H	L	H
MS MRY	L	H	H	L	L
MS STL	L	H	L	H	H
MS BACK	L	H	L	H	L
SS	L	H	L	L	H
MS INDEX SCAN	L	H	L	L	L
CH SCAN	L	L	H	H	H
STL/SLW/×2S	L	L	H	H	L
MEMORY LOCK (M/S)	L	L	H	L	H
MEMORY LOCK (S/S)	L	L	H	L	L
	L	L	L	H	H
	L	L	L	H	L
	L	L	L	L	H
	L	L	L	L	L

Table 2-12-1

[Abbreviations Used]
PIP : PICTURE IN PICTURE
MRY STL : MEMORY STILL
MS : MALTI STROBE
SS : SINGLE STROBE
SLW : SLOW
× 2S : × 2 SPEED PLAYBACK
CH : CHANNEL

2-12-2. DIGITAL NOISE REDUCTION

	DNR D5
DNR OFF	H
DNR ON	L

Table 2-12-2

2-12-3. POSITION INIT

This signal is for placing the next saving screen image in the initial position in the case of the multi-screen.

	P. INIT D6
NEXT POSITION	H
INITIAL POSITION	L

Table 2-12-3

2-12-4. MEMORY CLEAR

This block is a signal for clearing the data contents saved in memory.
When this bit has become "L", the digital memory clears the current memory contents.

	M • INH D7
MEMORY OPELATE	H
MEMORY INHIBIT	L

Table 2-12-4

2-13. BLOCK 10 AND BLOCK 11

These blocks are currently not in use, but they are reserved as blank blocks for future uses.

2-14. OUTLINE OF THE SSB MONITOR AND THE SV S.DATA AND ATR DATA MONITOR

2-14-1. SSB Monitor (Jig No. VHJ-0055)

Sections 2-4 through 2-13 showed the contents of each SSB data block. In this way, readout of each block's bit condition allows to grasp the VCR operating condition. Furthermore, it can help determining the location of the cause of trouble in case the mechanism or the control circuit faults.
The SSB monitor (Jig No. VHJ-0055) reads individual bit conditions of the SSB data, displaying them through LEDs. A monitor screen can also be connected for display of readout results.
For details on operation of the SSB monitor, refer to the attached instruction manual.

2-14-2. SV S.DATA AND ATR DATA Monitor (Jig No. VHJ-0056)

The system control MPU described in the next section is the main control microcomputer of the SSB system. Besides the above-mentioned SSB serial data exchange, this MPU also performs serial data exchange between the digital servo IC and the ATR (Auto tracking) MPU. SV S.DATA and ATR DATA are among these exchanged data.
The SV S.DATA consists of operation mode data, tracking data, etc. sent out to the servo IC and the ATR MPU. ATR DATA consists of the results of tracking correction computing at the ATR MPU and data indicating to which degree system-control MPU tracking data should be corrected, sent from the ATR MPU to the system-control MPU as serial data.
Serial/parallel conversion is necessary for readout of both kinds of data, since other data are being sent serially and by time division.
This monitor displays the results of readout by serial/parallel conversion, in bit units, through LED indicators. This allows to grasp the present condition of the servo control system and to determine the location of the cause of trouble in case of malfunction.
For details on operation of this monitor, refer to the attached instruction manual.

2-15. SYSTEM-CONTROL MPU (IC301)

The system-control MPU (IC301) is the main control MPU of the SSB system.
System-control MPUs used for models of different classes are as follows :
Popular models (example : VHR-4100 series) : LC66508B 4-bit, 8 kbytes
Medium-class models (example : VHR-4300 series) : LC66512A 4-bit, 12 kbytes
High-class models (example : VHR-D4600 series) : LC66516A 4-bit, 16 kbytes

2-15-1. Function of Each Pin of the System-control MPU (LC66508B, (LC66512A) [LC66516A] series)

Pin No.	Name	Input/Output Signal	I/O		Input/Output Function
1	SI0	SSB DATA	I	SSB	SSB input/output data
2	SO0		O		
3	$\overline{\text{SCK0}}$	SSB CLK	O		Clock pulse output to SSB.
4	INT0	CTL P.	I	External interrupt	0 to approx. 5kHz pulse. 30Hz during PLAY and REC.
5	INT1	(REF30 − 7 P)	I		30Hz pulse. Synchronized to VIDEO in the EE mode, and to the RF switch pulse during playback.
6	P31	$\overline{\text{NORMAL}}$ [S.SSP]	O	Audio	(Output when audio is NORMAL) [Pulse input for sound-sync strobe].
7	P32	(DM REC+OSD)	O	Video	[Output during on-screen operations except when in INSERT mode or during digital-memory operation].
8	$\overline{\text{HOLD}}$	$\overline{\text{HOLD}}$			+ 5V
9	P40	SW DATA 1	I	Mechanism switch	Switches showing the mechanism position.
10	P41	SW DATA 2	I		
11	P42	SW DATA 3	I		
12	P43	E P SW	I		Switch for determining whether cassette recording is possible.
13	P50	[$\overline{\text{V SYNC MUTE}}$]	O	[Digital memory]	[Signal for turning the dummy vertical sync signal off].
14	P51	0/1 DATA	I	Servo	(Control pulse "0" or "1" data (for search function)).
15	P52	CTL GAIN DOWN	O		CTL AMP circuit gain switching signal. Output at POS SW 2 and less.
16	P53	MC-BR	O		Capstan motor brake signal.
17	SI1	ATR DATA	I	Serial	Data input from the servo ATR microcomputer.
18	SO1	SV S.DATA	O		Serial data output to the servo IC.
19	$\overline{\text{SCK1}}$	SV S.CLK	O		Serial clock pulse output to the servo IC.
20	P63	[MEMORY ON]	O	[Digital memory]	[Memory screen output command signal]
21	P70	[AF REC]	O		[Output signals for each type of digital memory operation]
22	P71	[VD REC]	O		
23	P72	[LVL 0]	O		[Output during DNR operation. Signals for DNR operation L, M & H]
24	P73	[LVL 1]	O		
25	P80	[DNR MODE]	O		[Output during DNR operation. DNR operation ON signal].
26	P81	[$\overline{\text{SCLR}}$]	O		[Operation disabling signal for the digital memory gate array].
27	P82	[WRITE]	O		[Command signal for memory write-in].
28	P83	[0.5H]	O		[0.5H correction signal. Output during STILL, MEMORY STILL and SS modes].
29	$\overline{\text{INT2}}$	$\overline{\text{RF SW P.}}$	I	External	0 to 30Hz pulse. 30Hz during playback, etc.
30	TEST				Ground
31	Vss				Ground
32	OSC1				MPU clock oscillation output pins. Clock frequency is 4MHz.
33	OSC2				
34	$\overline{\text{RES}}$	$\overline{\text{RESET}}$	I		MPU initial setting or all-clear.
35	$\overline{\text{INT3}}$	DOC P.	I	External interrupt	* Pulse with an amplitude greater than 0 and smaller than 33ms. STILL noise shifting pulse (output in the STILL and MEMORY STILL modes).
36	$\overline{\text{INT4}}$	$\overline{\text{AV CTL}}$	I		ANT/VIDEO output is fixed to ANT at low level.
37	INT5	C. FG P.	I		0 to approx. 6kHz pulse. The frequency required for recognition is approx. 300Hz.
38	PA0	ML-F	O	Motor drive	Forward direction loading command signal (FL, TL).
39	PA1	ML-R	O		Reverse direction loading command signal (FL, TL).
40	PA2	ML-L	O		Low loading speed command signal.
41	PA3	ML-M	O		Medium loading speed command signal.
42	PB0	REC	O	Video	Recording command signal.
43	PB1	P. B. HIGH	O		Playback screen output command signal.
44	PB2	STILL+SLOW+X2S	O		(Output in the STILL, SLOW and X2S modes).
45	PB3	SPECIAL PLAY	O		Output in the special playback (CUE, REV, STILL, SLOW, F.ADV, A. DUB PAUSE) modes.
46	PC0	ANT/$\overline{\text{VIDEO}}$	O		ANT/VIDEO switching signal.
47	PC1	[INSERT HIGH]	O		[Output in the INSERT mode].
48	PC2	[FE CONTROL]	O		
49	VREF1	REF VOLT	I	Sensor	Reference voltage for the microcomputer built-in comparator.
50	PD0	REEL P.	I		0 to approx. 300Hz pulse. Its period changes according to reel table rotation.
51	PD1	DEW S.	I		For dew detection.
52	CMP2	$\overline{\text{TAPE TOP S.}}$	I		For tape winding start detection.
53	CMP3	$\overline{\text{TAPE END S.}}$	I		For tape winding end detection.
54	TRA	FL SW	I	Mechanism switch	Front loading mechanism switch (3 values input : Low = cassette out ; medium = FL mode ; high = cassette loading completed).
55	TRB	TAPE SPEED	I	Servo	Result of tape speed detection by the servo system (high = LP ; low = SP).
56	P00	A · MUTE	O	Audio	Audio output inhibiting indication signal.
57	P01	A · REC MUTE	O		Normal audio output and recording inhibiting indication signal.
58	P02	[BIAS CTL]	O		Recording bias timing control.
59	P03	X2S	O		Output in the X2S mode.
60	P10	[A · DUB]	O		Output in the A. DUB mode.
61	P11	POWER UP	O	Power supply	Output always except when power is off.
62	P12	AUDIO SELECT 0	O	Audio	(Audio ST/L/R switching output)
63	P13	AUDIO SELECT 1	O		
64	VDD				+ 5V

Table 2-15-1

Functions between brackets ( ) are provided in the LC66512A for medium-class models, and those between square brackets [ ] in the LC66516A for high-class models. Other functions are common for all models, except the one marked * which is only included in the LC66508B for popular models.

2-15-2. Description of the Main Input Signals of the System-control MPU (IC301)

1) Mechanism Mode Detection Switch Data (Pins 9, 10 and 11)

In addition to the VCR main unit operation modes (STOP, F.FWD, REW, PLAY, REC, R-SEARCH, F-SEARCH, STILL, SLOW and ETS), there are several mechanism exclusive modes (listed below). At these modes, set momentarily at the time of VCR main unit mode switching, important tape protecting operations, etc. are performed.

In order to execute mode control, the mechanism mode detection switch data (a rotary switch is used to output 3-bit mechanism mode data) and the front-loading mechanism switch data signal, described below, are input to the system control MPU and used for computing control.

- 3-bit Mechanism Mode Detection Switch Data

Mechanism Mode SW Pos. No.	Mechanism Mode Detection SW Input			Mechanism Mode Names	VCR Main Unit Mode Names
	SW DATA1 Pin 9	SW DATA2 Pin 10	SW DATA3 Pin 11		
7	L	L	L	INITIAL	STAND BY (Power OFF at cassette IN)
1	L	H	H	BRAKE	None
2	H	L	H	STOP	STOP, F • FWD, REW
3	L	L	H	STILL	STILL, F • ADV, SLOW, PAUSE
4	H	H	L	PLAY	PLAY, REC, F-SEARCH, × 2S
5	L	H	L	IDLER (at F/R transition)	None
6	H	L	L	REV.	R-SEARCH
0	H	H	H	During mode changing	None

Table 2-15-2

2) Front-Loading Switch Input (Pin 54)

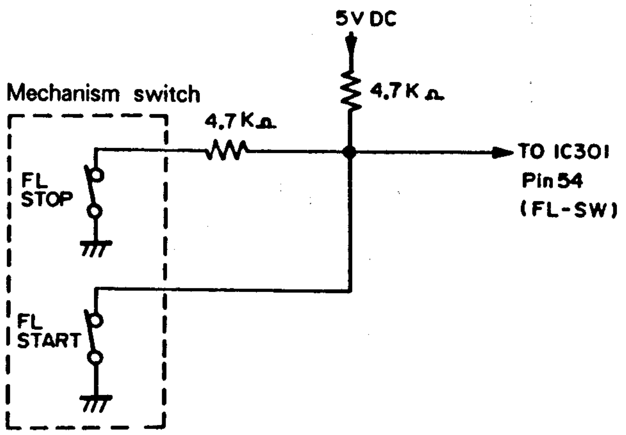
The mechanism is equipped with a switch to detect cassette ejection and insertion (FL START switch), and another to detect completion of cassette loading (FL STOP).

These two switches are included in the circuit shown below, which generates the variable voltage (three values) to be input to Pin 54 of the system-control MPU (IC301) for front-loading condition computing.

- **3 Values of the Variable Input Voltage and Front Loading Conditions**

FL-SW (Voltage input to Pin 54)	Front Loading Condition
LOW (0V)	Cassette out
MID (2.5V)	Front loading period from cassette insertion
HIGH (5V)	Cassette loading completed

Table 2-15-3



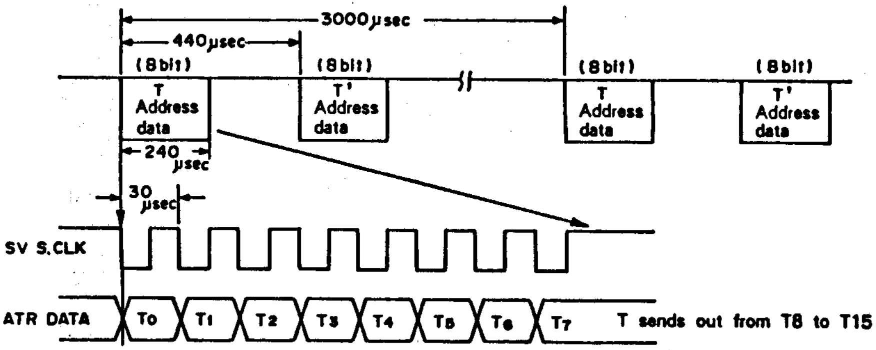
- Front Loading 3 - Value Variable Voltage Generation Circuit

Fig. 2-15-1

3) Tracking Data Input from the ATR MPU (ATR DATA : Pin 17)
(Applicable to models equipped with the ATR (Auto Tracking) function)

The system-control MPU outputs tracking data, with the preset values corresponding to each mode, to the servo IC and the ATR MPU through the SV S.DATA line. The ATR MPU calculates, from the envelope sampling value and the tracking data, how much this latter should be turned up or down, then inputs the corresponding data correction command to the system-control MPU as serial data.
For example, in case a Δ T up/down operation becomes necessary after SV S.DATA has sampled the envelope at a T0 tracking value, this Δ T is sent out from the ATR MPU as serial data.
Transmission of this data (ATR DATA) is performed as shown in the diagram below.

[ATR Data Form]



* ATR DATA is sent out from ATR MPU in the SV S.CLK timing from the system-control MPU.

Fig. 2-15-2

[Contents of the ATR Serial Data T/T']

BIT	T Data Contents
T0	TRK 0
T1	TRK 1
T2	TRK 2
T3	TRK 3
T4	TRK 4
T5	TRK 5
T6	UP/DOWN
T7	Block recognition "H"

BIT	T' Data
T8	ATR ENV
T9	ATR DISP1
T10	ATR DISP2
T11	TRK - SEL
T12	*
T13	*
T14	*
T15	Block recognition "L"

Table 2-15-4

* : Not used

[Description of T Data Contents]

a. T0 to T5 (track 0 to track 5)
Tracking value correction amount data. Track 0 is the least significant bit.

TRK5	TRK4	TRK3	TRK2	TRK1	TRK0	Correction Amount
L	L	L	L	L	L	0 count
L	L	L	L	L	H	1 count
⇩	⇩	⇩	⇩	⇩	⇩	⇩
H	H	H	H	H	L	62 count
H	H	H	H	H	H	63 count

Table 2-15-5

b. T6 (up/down)
Command data to indicate whether tracking correction should be performed in the upward or downward direction (set to "up, 0 count" when tracking correction amount is zero).
"H" : Up
"L" : Down

c. T7 (Block Recognition Bit)
Bit for T data block recognition. Normally "H".

[T' Data Contents]

a'. T8 (ATR ENV)
This bit is applicable only to the SP mode of the NTSC system. It is "H" under the following conditions :

Double Speed Playback

- From the instant when the double speed playback is set until the ATR MPU computes the optimum tracking value.

STILL Mode

- From the instant when the STILL mode is set until the noise shifting operation is completed.

SLOW Mode

- From the instant when the SLOW mode is set until when no more tracking value changes are performed (tracking correction amount = 0).

b'. T9, T10 (ATR DISP1, 2)
ATR MPU operating condition data.

ATR DISP 1	ATR DISP 2	Operating Condition	
L	L	Manual detection	ATR ON signal "H"
L	H	ATR operation (during detection)	ATR ON signal "L"
H	L	ATR operation (detectiorcompleted)	ATR ON signal "L"
H	H	When the optimum ATR value could not be detected	ATR ON signal "L"

Table 2-15-6

c'. T11 (TRK SEL)
These data, stored inside the system-control MPU, switch the tracking data table during the SLOW and STILL modes. The system-control MPU is provided with two kinds of SLOW/STILL data tables, SL - TR1 and SL - TR2. Selection between the two is performed by the TRK SEL serial data from the ATR MPU.

TRK SEL "H" : SL-TRK1 is selected (preset value : 46)
TRK SEL "L" : SL-TRK2 is selected (preset value : 69)

d'. T15 (Block Recognition Bit)
Bit for T' data block recognition. Normally "L".

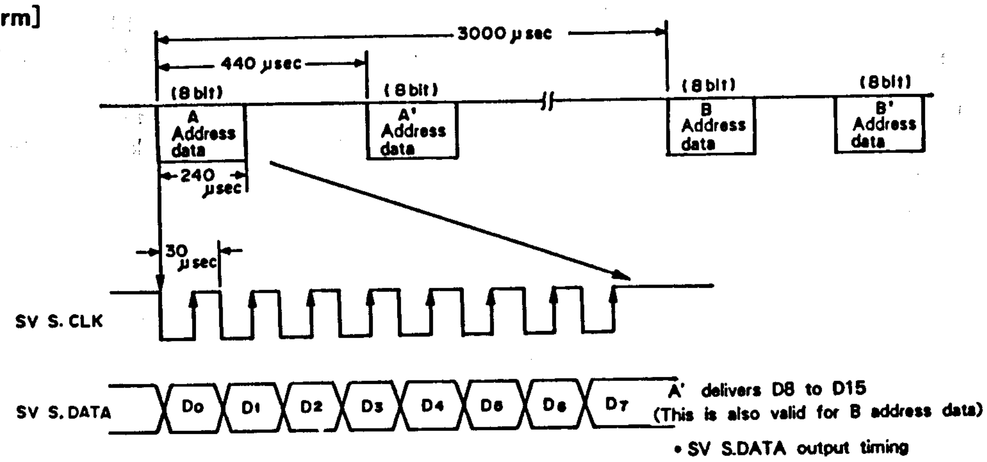
(3) Description of the Main Output Signals of the System-control MPU (IC301)

Besides performing data exchange with the timer/tuning control MPU, the remaining tape calculating MPU, etc. through the SSB line, the system-control MPU outputs control signals to each individual pin. The main control signal among these are described next.

1) SV S.DATA (Pin 18)

Sends out mode data, tape speed data, tracking data, etc. to the digital servo IC and the ATR MPU in the form shown below.

[SV S.DATA Form]


3000 μsec
440 μsec
(8 bit)
A Address data
(8 bit)
A' Address data
(8 bit)
B Address data
(8 bit)
B' Address data
240 μsec
30 μsec
SV S. CLK
SV S. DATA
D0
D1
D2
D3
D4
D5
D6
D7

A' delivers D8 to D15 (This is also valid for B address data)

• SV S.DATA output timing

Fig. 2-15-3

[SV S.DATA Contents]

	A Address Data	B Address Data
D0	MODE – D0	TRK – DATA0
D1	MODE – D1	TRK – DATA1
D2	MODE – D2	TRK – DATA2
D3	MODE – D3	TRK – DATA3
D4	F/R	TRK – DATA4
D5	TS – CNT0	TRK – DATA5
D6	TS – CNT1	TRK – DATA6
D7	TS – CNT2	SLOW/NORM
	A' Address Data	B' Address Data
D8	CAP – ON	CTL – DUTY
D9	DRUM – ON	REMARK
D10	ENV – ON	ATR ON
D11	VD – ON	STILL/SLOW
D12	*	*
D13	F – ADV – P	*
D14	*	*
D15	Address Differ. "1"	Address Differ. "0"

* : Not used

Table 2-15-7

[Description of SV S.DATA Contents] …LOW Activ (1 = Low, 0 = High)

1. A Address Data D0 to D3 (Modes D0 to D3)
   Operation mode indicating data for the servo IC and the ATR MPU

MODO D0~D3				Operation Mode	Servo Control Condition
D3	D2	D1	D0		
0	0	0	0	EE M SPD1	Used for reel rotation speed control when entering the EE and playback modes.
0	0	0	1	PB M SPD1	
0	0	1	0	EE M SPD2	
0	0	1	1	FF + REW	F.FWD/REW mode.
0	1	0	0	PB M SPD2	Same as the above-mentioned PB M SPD1.
0	1	0	1	STILL	STILL mode w/o noise shifting.
0	1	1	0	INSERT	INSERT mode control.
0	1	1	1	REC	Recording mode.
1	0	0	0	EDIT	Continued shooting control.
1	0	0	1	PB NOR	Playback mode.
1	0	1	0	PB D-FX	Entering the playback mode.
1	0	1	1	PB *2	Entering the playback mode.
1	1	0	0	SEARCH1	Search mode.
1	1	0	1	SEARCH2	Entering the search mode.
1	1	1	0	FINE STILL	STILL with noise shifting.
1	1	1	1	FINE SLOW	Intermittent SLOW with noise shifting.

Table 2-15-8

2. A Address Data D4 (F/R)
   Advance (FWD) or reverse (REV) tape transport direction indicating data.
   1 = Advance
   0 = Reverse

3. A Address Data D5 to D7 (TS-CNT0 to 2)
   Tape speed SP/LP/EP control indication.

TS-CNT0	TS-CNT1	TS-CNT2	Servo IC Operating Condition	
0	0	0	Tape speed recognition.	
0	0	1	EP	
0	1	0	LP	
0	1	1	SP	
1	0	0	Hold condition. Data just before TS-CNT0 becomes "1".	
1	0	1	EP	After TS-CNT0 is set to "1" and the servo IC to the respective tape speed, TS-CNT1 and TS-CNT2 are set to "0", entering the hold condition above.
1	1	0	LP	
1	1	1	SP	

* In PAL models, EP is treated as LP, resulting in two speed settings.

Table 2-15-9

4. A' Address Data D8 (CAP-ON)
Capstan motor rotation/stop indicating data
   1 : Rotation (CSE is output from the servo IC)
   0 : Stop

5. A' Address Data D9 (DRUM-ON)
Head drum motor rotation/stop indication
   1 : Rotation (DSC is output from the servo IC)
   0 : Stop

6. A' Address Data D10 (ENV-ON)
ON/OFF indication for the envelope detection signal input to the servo IC
   1 : ON (ROTARY and HA-SW signals are switched by the envelope signal at the servo IC)
   0 : OFF (The envelope signal is ignored)

7. A' Address Data D11 (VD-ON)
ON/OFF indication for the dummy VD signal output from the servo IC
   1 : VD output ON
   0 : VD output OFF

8. A' Address Data D13 (F-ADV-P)
Frame-advance control signal used for noiseless SLOW and STILL playback
When this bit is "1", the servo IC performs frame-advance operation synchronized to the RF-SW pulse reference edge.

9. A' Address Data D15
A/A' addresses differentiating bit. Normally "1".

10. B Address Data D0 to D6 (TRK-DATA 0 to 6)
Compose the tracking data with the 7-bit codes shown below.

(B Address Data D0 to D6, Tracking Data Table)

DATA 0	DATA 1	DATA 2	DATA 3	DATA 4	DATA 5	DATA 6	Servo IC TRC Step
1	1	1	1	1	1	1	0
0	1	1	1	1	1	1	1
↓	↓	↓	↓	↓	↓	↓	↓
0	0	1	1	1	0	1	Double speed preset 35
↓	↓	↓	↓	↓	↓	↓	↓
1	0	0	0	1	0	1	Slow preset 46
↓	↓	↓	↓	↓	↓	↓	↓
1	0	1	0	0	0	1	Playback preset 58
↓	↓	↓	↓	↓	↓	↓	↓
1	0	0	0	0	0	0	126
0	0	0	0	0	0	0	127

* At the servo IC, a tracking delay corresponding to the TRK-DATA is allowed.

Table 2-15-10

11. B Address Data D7 (SLOW/NORM)
Signal indicating whether the TRK-DATA delivered by the B addresses is for the SLOW or NORMAL mode
   1 : Input SLOW mode tracking data
   0 : Input NORMAL mode tracking data

12. B' Address Data D8 (CTL-DUTY)
Duty specification for the CTL recording signal output from the servo IC (used for VISS/VASS control)
   1 : CTL DUTY is specified to approx. 28% (code "1")
   0 : CTL DUTY is specified to approx. 60% (code "0")

13. B' Address Data D9 (REMARK)
CTL signal re-ecording indication (used for VISS/VASS control)
   1 : CTL signal rewriting
   0 : No operation

14. B' Address Data D10 (ATR-ON)
Operation indicating signal sent to the ATR MPU (only for models provided with ATR function)
   1 : The ATR MPU performs tracking calculation control.
   0 : No operation

15. B' Address Data D11 (STILL/SLOW)
Indicates the ATR MPU to set the STILL or SLOW mode (only for models provided with ATR function).
   1 : STILL mode
   0 : SLOW mode

16. B' Address Data D15
B/B' addresses differentiating bit. Normally "0".

2) Control Signals for the Digital Memory (work with the LC66516A for high-class models)

The control signals for the digital memory are composed of signals output from the SSB line, which inputs/outputs the above-mentioned serial data, and from the various pins of the system-control MPU.
Signals turned into data through 2 or more pins will be described here.

a. DNR (Digital Noise Reduction) Control Signals (LVL, DNR MODE)
LVL 0 : Pin 23 output
LVL 1 : Pin 24 output
DNR MODE : Pin 25 output

DNR MODE	LVL 0	LVL 1	Control Condition
0	0	0	DNR OFF
1	1	0	DNR ON (HIGH)
1	0	1	DNR ON (MID)
1	1	1	DNR ON (LOW)

1 : HIGH, 0 : LOW

Fig 2-15-11

- DNR operation changes as shown below each time the DNR key is pressed, if set initially to DNR-OFF.

→ DNR OFF → DNR ON (HIGH) → DNR ON (MID) → DNR ON (LOW) ↵

Table 2-15-12

1. Digital Mode Control Signals (PAL MODE 0/1) (only for PAL models)
PAL MODE 0 : Pin 21
PAL MODE 1 : Pin 22

PAL MODE 0	PAL MODE 1	Digital Operation mode
0	0	Other than the modes below
1	0	MEMORY STILL, SINGLE STROBE
0	1	SLOW, F.ADV, STILL
1	1	Double-speed playback

0 : LOW, 1 : HIGH

Table 2-15-13

3) Audio Signal Control Output

a. Audio Output Switching Control Signal
The audio signal control signal, corresponding to the control data of the SSB line (block 8), which inputs/outputs the above-mentioned serial data, is output from various pins of the system-control MPU. Signals turned into data through 2 or more pins will be described here.
NORMAL : Pin 6
AUDIO SELECT 0 : Pin 62
AUDIO SELECT 1 : Pin 63

AUDIO SELECT 0	AUDIO SELECT 1	NORMAL	Audio Switching Operation
OPEN	LOW	HIGH	STEREO
OPEN	OPEN	HIGH	L/MAIN
LOW	OPEN	HIGH	R/SUB
LOW	LOW	LOW	NORMAL

Table 2-15-14

2-16. ATR (AUTO TRACKING) MPU (IC381 : M50927 Series) (for modesl equipped with ATR function)

Using as a reference the tracking data sent from the system-control MPU as SV S. data during video playback, the ATR MPU converts the detected playback envelope signal into digital, then calculates to which degree the optimum tracking value (which makes playback envelope level maximum) differs from the above-mentioned reference tracking data. The resulting data (indicating how many counts and in which direction the reference tracking data should be corrected) are sent out to the system-control MPU as serial ATR data. The MPU original tracking data are corrected by adding to them the ATR data correction value. After this correction, the tracking data are sent to the servo IC and the ATR MPU through the SV S. DATA line. The ATR MPU determines whether these data should be further corrected. The optimum tracking value is obtained by repeating this ATR operation. On the other hand, the servo IC uses the tracking data gradually corrected by the ATR operation to control rotation of the capstan motor, allowing for a smoother and more precise servo control.

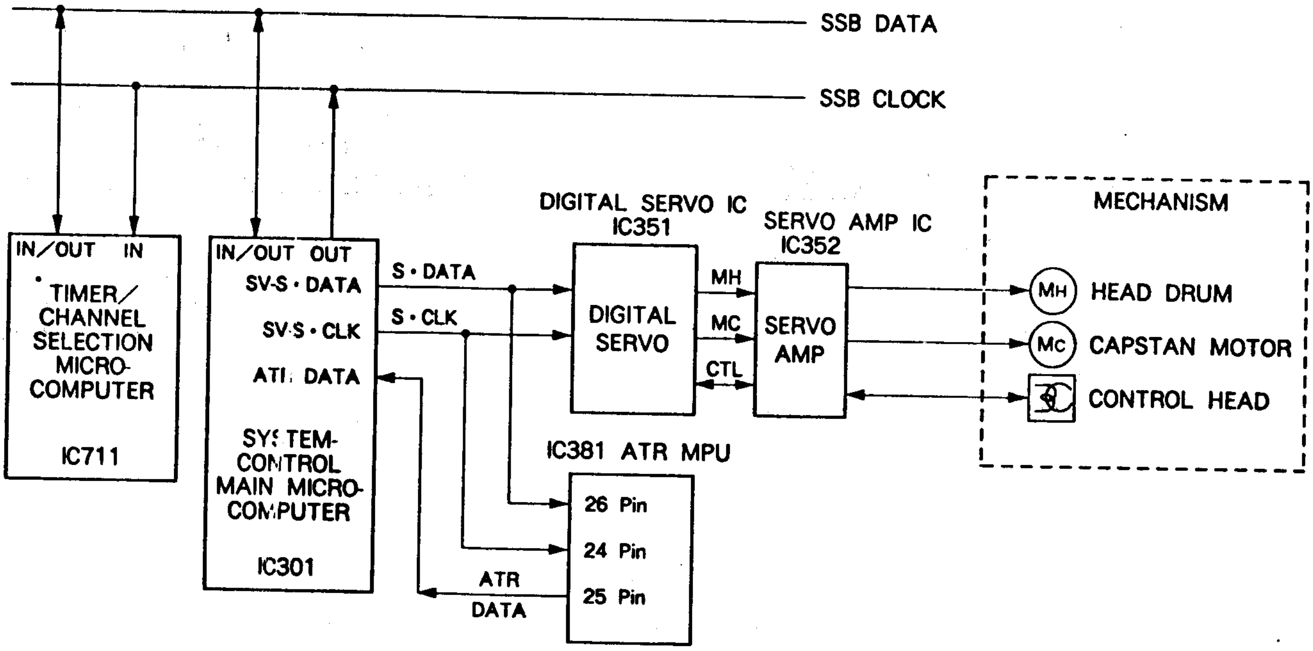

SSB DATA
SSB CLOCK
IN/OUT
IN
TIMER/ CHANNEL SELECTION MICRO-COMPUTER
IC711
IN/OUT
OUT
SV-S · DATA
SV-S · CLK
ATR DATA
SYSTEM-CONTROL MAIN MICRO-COMPUTER
IC301
S · DATA
S · CLK
DIGITAL SERVO IC
IC351
DIGITAL SERVO
SERVO AMP IC
IC352
MH
MC
CTL
SERVO AMP
MECHANISM
MH
HEAD DRUM
Mc
CAPSTAN MOTOR
CONTROL HEAD
IC381 ATR MPU
26 Pin
24 Pin
25 Pin
ATR DATA

Fig 2-16-1

2-16-1. ATR Operation Modes

- PLAY Mode
  When the operation button (TRACK) is pressed in the PLAY mode, the ATR ON signal sent in by the serial SV S. data is confirmed, starting ATR operation. Namely, in the PLAY mode the ATR operation is not performed automatically; it should be started manually.
- STILL Mode/SLOW Mode/×2 Speed Playback Mode
  When entering one of these modes, the ATR ON signal is sent in automatically by the serial SV S. data from the system-control MPU, and ATR operation starts automatically.

2-16-2. Principle of ATR Operation

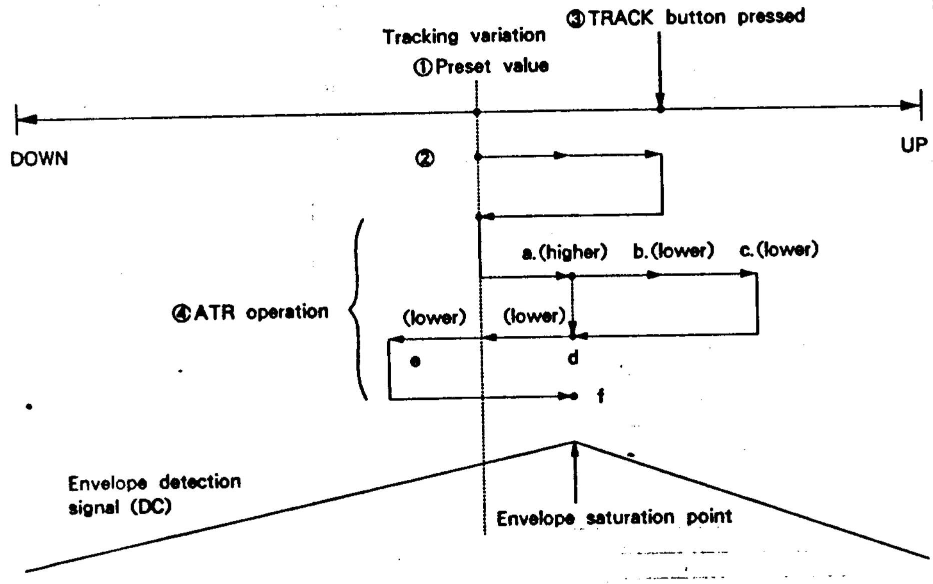


Fig. 2-16-2

④ATR Operation
a. A 2-step upward correction command is issued.
b. The envelope level after 2-step correction is compared with that just after preset. If the former is higher than the latter, this higher value is used as reference for the next envelope comparison.
c. The 2-step upward correction command is given again. If this time envelope comparison gives a "lower" result, a third 2-step upward correction command is issued.
d If two consecutive envelope comparisons give a "lower" result, the value is lowered to the step before getting "lower", then downward correction is performed from there.
e. If two consecutive envelope comparisons give a "lower" result during downward correction, the middle point between two upward "lower" results and two downward "lower" results is taken as the envelope saturation point.
f. Finally, upward correction is performed to the detected saturation point. This completes ATR operation.
Note :Envelope comparison always gives one of the following results : "higher", "lower" or "equal".

- The above diagram (Fig. 2-16-2) shows manual ATR operation in the PLAY mode. A detailed explanation of this operation sequence follows.

① When the VTR enters the PLAY mode, the playback preset tracking data is sent out to the servo IC and the ATR MPU from the system-control MPU by the SV S. DATA, starting the initialize operation. Since the ATR ON signal input to the ATR MPU as SV S. DATA at this time is "high", ATR operation does not takes place, and a tracking correction amount (ATR data) of "UP 0" is sent to the MPU.

② If the manual tracking button (+/−) is pressed in this condition, the system-control MPU will perform up/down correction on the playback preset tracking data.

③ If the IR remote control ATR button (TRACK) is pressed, the system-control MPU will set its own tracking data back to the playback preset value, and simultaneously send the SV S. DATA ATR ON signal "low" to the ATR MPU.

④ Upon receiving the ATR ON signal "low", the ATR MPU starts ATR operation. The first ATR operation is performed using the tracking data as it was just before the ATR ON signal became "low". Then, a command indicating for how many counts the tracking data should be corrected is sent to the system-control MPU as serial ATR data. The ATR MPU uses the received corrected tracking data to execute the second ATR operation. This sequence of operations is repeated until the optimum tracking value is obtained. When the ATR MPU detects this optimum value, ATR operation is finished and tracking correction amount (ATR data) is reset to "UP 0".

Note : When entering the still/slow/×2 speed mode, the ATR ON signal "low" is automatically input to the ATR MPU, so the ATR operation in ④ is performed. Furthermore, if the manual (+/−) button is pressed during ATR operation, this operation stops and manual operation takes priority.

2-16-3. Table of ATR MPU Pin Functions

- For information on Pin 24 (SV S. data) and Pin 25 (ATR data), refer to section 2-15.

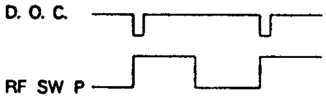
<table>
<tr><th>Pin No.</th><th>Name</th><th>Input/Output Signal</th><th>I/O</th><th>Input/Output Function</th></tr>
<tr><td>1</td><td>$\overline{RESET}$</td><td>$\overline{RESET}$</td><td>I</td><td>Reset input. "L" level is applied to this pin, the microcomputer is reset.</td></tr>
<tr><td>2</td><td>INT</td><td>RF SW P</td><td>I</td><td>RF switch pulse input. Receives external interrupt signals.
The head switching signal (square, 25Hz) is input here.</td></tr>
<tr><td>3</td><td>AV_{SS}</td><td>AV_{SS}</td><td></td><td>Analog power input. Ground terminal for the A/D converter.</td></tr>
<tr><td>4</td><td>V_{REF}</td><td>V_{REF}</td><td>I</td><td>Reference voltage input. Input terminal for A/D converter reference power.</td></tr>
<tr><td>5</td><td>K_0</td><td>ENV</td><td>I</td><td rowspan="2">Analog input terminal for the A/D converter. The playback video signal envelope detection output is input to ENV, and the playback audio Hi-Fi signal envelope detection output to Hi-Fi ENV. In Hi-Fi models, video ENV and audio ENV signals are combined, and tracking control is performed at the optimum point for both.</td></tr>
<tr><td>6</td><td>K_1</td><td>HIFI ENV</td><td>I</td></tr>
<tr><td>7</td><td>AV_{DD}</td><td>AV_{DD}</td><td></td><td>Analog power input. Power input terminal for the A/D converter.</td></tr>
<tr><td>8</td><td>S_0</td><td>NTSC/PAL</td><td>I</td><td rowspan="4">Receives signals indicating the TV system, the number of video heads and whether digital functions are available or not, setting auto-tracking operation mode accordingly as follows :
* : Not used
<table>
<tr><th>S_3</th><th>S_2</th><th>S_1</th><th>S_0</th><th></th></tr>
<tr><th>DIGITAL</th><th>3-head</th><th>2-head</th><th>NTSC/PAL</th><th>Operation mode</th></tr>
<tr><td>L</td><td>L</td><td>L</td><td>L</td><td>*</td></tr>
<tr><td>L</td><td>L</td><td>L</td><td>H</td><td>*</td></tr>
<tr><td>L</td><td>L</td><td>H</td><td>L</td><td>PAL 2-head</td></tr>
<tr><td>L</td><td>L</td><td>H</td><td>H</td><td>NTSC 2-head</td></tr>
<tr><td>L</td><td>H</td><td>L</td><td>L</td><td>PAL 3-head</td></tr>
<tr><td>L</td><td>H</td><td>L</td><td>H</td><td>NTSC 3-head</td></tr>
<tr><td>L</td><td>H</td><td>H</td><td>L</td><td>PAL 4-head</td></tr>
<tr><td>L</td><td>H</td><td>H</td><td>H</td><td>NTSC 4-head</td></tr>
<tr><td>H</td><td>L</td><td>L</td><td>L</td><td>*</td></tr>
<tr><td>H</td><td>L</td><td>L</td><td>H</td><td>*</td></tr>
<tr><td>H</td><td>L</td><td>H</td><td>L</td><td>PAL 2-head digital</td></tr>
<tr><td>H</td><td>L</td><td>H</td><td>H</td><td>*</td></tr>
<tr><td>H</td><td>H</td><td>L</td><td>L</td><td>*</td></tr>
<tr><td>H</td><td>H</td><td>L</td><td>H</td><td>*</td></tr>
<tr><td>H</td><td>H</td><td>H</td><td>L</td><td>PAL 4-head digital</td></tr>
<tr><td>H</td><td>H</td><td>H</td><td>H</td><td>NTSC 4-head digital</td></tr>
</table></td></tr>
<tr><td>9</td><td>S_1</td><td>2HEAD</td><td>I</td></tr>
<tr><td>10</td><td>S_2</td><td>3HEAD</td><td>I</td></tr>
<tr><td>11</td><td>S_3</td><td>DIGITAL</td><td>I</td></tr>
<tr><td>12</td><td>D_0</td><td>HIFI</td><td>I</td><td>A "high" level signal is input to this pin when inputs to Pin 5 (ENV), Pin 6 (Hi-Fi ENV) and their composite are detected.</td></tr>
<tr><td>13</td><td>D_1</td><td>ENV SEL</td><td>I</td><td>Envelope selector signal. Detects the envelope signal in 4-head models.</td></tr>
<tr><td>14</td><td>CNV_{SS}</td><td>CNV_{SS}</td><td>I</td><td>This pin is connected to V_{SS} in order to keep its input always "low" (0 V).</td></tr>
<tr><td>15</td><td>V_{SS}</td><td>V_{SS}</td><td></td><td>GND</td></tr>
<tr><td>16</td><td>D_2</td><td>CTL</td><td>I</td><td>Control pulse input terminal. Used for detection of abnormalities during ATR operation.</td></tr>
<tr><td>17</td><td>D_3</td><td>$\overline{\text{ATR CANCEL SW}}$</td><td>I</td><td>ATR operation is stopped when a change from "high" to "low" level is detected.</td></tr>
<tr><td>18</td><td>D_4</td><td>SLOW TR PULSE</td><td>I</td><td>Receives the tracking pulse (Ʊ) during normal slow servo operation. It becomes "high" if an abnormality occurs, disabling the ATR operation.</td></tr>
<tr><td>19</td><td>D_5</td><td>NOISE ADV PULSE</td><td>O</td><td>If noise pulse is not in the normal position when changing from playback to STILL mode, a noise advance pulse is output from this pin.</td></tr>
<tr><td>20</td><td>D_6</td><td>SP</td><td>I</td><td>Inputs the result of tape speed recognition. "High" in the SP mode, otherwise "low".</td></tr>
<tr><td>21</td><td>D_7</td><td>D. O. C.</td><td>O</td><td>ATR operation detection signal input for 2-head models equipped with special playback functions.
Advance noise generated once every field during still playback in 2-head models into the vertical blanking periods (upper or lower portions of the TV screen) to obtain a noiseless picture. This is achieved by advancing this D.O.C. (noise position) to rise position of RF switching pulse.
 </td></tr>
<tr><td>22</td><td>D_8</td><td>SAMPLING PULSE</td><td>O</td><td>Timing pulse for envelope A/D conversion (sampling).</td></tr>
<tr><td>23</td><td>$\overline{S_{RDY}}$</td><td>ATR LED</td><td>O</td><td>Outputs a "high" signal during ATR operation. Operating condition of this IC can be confirmed with the ATR LED indication.</td></tr>
<tr><td>24</td><td>CLK</td><td>SV S. CLK</td><td>I</td><td>Clock input for serial data transmission between this MPU, the system-control MPU and the servo IC.</td></tr>
<tr><td>25</td><td>S_{OUT}</td><td>ATR DATA</td><td>O</td><td>Outputs the tracking value and the ATR operation indication signal to the system-control MPU as serial data.</td></tr>
<tr><td>26</td><td>S_{IN}</td><td>SV S. DATA</td><td>I</td><td>Input for serial data signals transmitted between the system-control MPU, the servo IC and this MPU.</td></tr>
<tr><td>27</td><td>X_{OUT}</td><td>X_{OUT}</td><td>O</td><td rowspan="2">I/O terminal of the built-in clock circuit. Clock frequency is 4MHz.</td></tr>
<tr><td>28</td><td>X_{IN}</td><td>X_{IN}</td><td>I</td></tr>
<tr><td>29</td><td>CNTR</td><td></td><td></td><td>Not used</td></tr>
<tr><td>30</td><td>V_{DD}</td><td></td><td></td><td>+5V</td></tr>
</table>

Table 2-16-1

2-17. TAPE REMAINING TIME CALCULATOR MPU (IC304)

2-17-1. Outline

This MPU performs tape type recognition and remaining time calculation on the basis of the VTR operating condition.

Tape recognition is performed by measuring the respective reel rotation periods from the supply and take-up reel pulses input to the MPU. These values are raised to second power, added, and then compared with values in the tape recognition table stored in the MPU built-in ROM.

Tape remaining time is calculated using the parameters (L: tape total length, r: reel hub diameter, t : tape thickness) determined by tape type recognition as explained above and the supply/take-up reel rotation period (measured from the reel pulse). As shown below, the peripheral circuits of this tape remaining time calculator MPU consist of the SSB line, which outputs the calculation results and the VTR operation mode input, and the calculation signal input (supply/take-up reel pulse) circuit, in a block configuration. The control pulse input from the servo section is used only for tape recognition, a stable tape transport during reel rotation period measurement being a necessary condition.

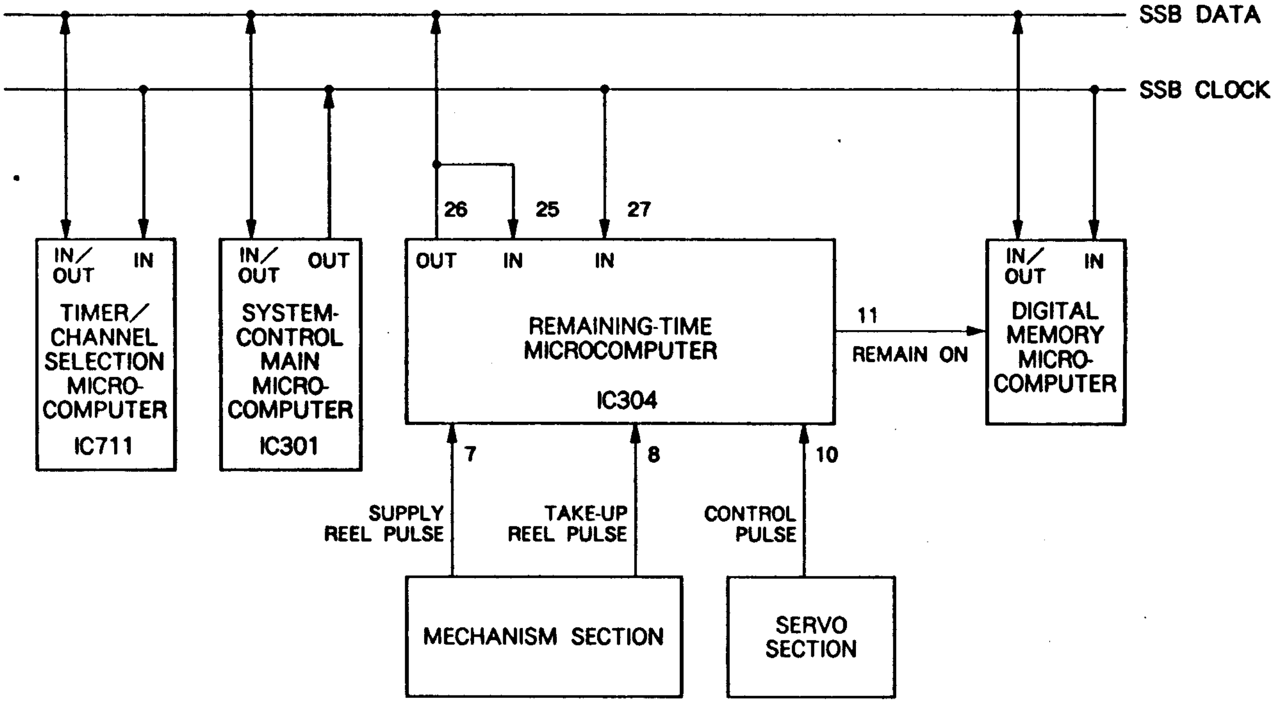

SSB DATA
SSB CLOCK
IN/ OUT
IN
TIMER/ CHANNEL SELECTION MICRO-COMPUTER
IC711
IN/ OUT
OUT
SYSTEM-CONTROL MAIN MICRO-COMPUTER
IC301
26
25
27
OUT
IN
IN
REMAINING-TIME MICROCOMPUTER
IC304
11
REMAIN ON
IN/ OUT
IN
DIGITAL MEMORY MICRO-COMPUTER
7
8
10
SUPPLY REEL PULSE
TAKE-UP REEL PULSE
CONTROL PULSE
MECHANISM SECTION
SERVO SECTION

Fig. 2-17-1

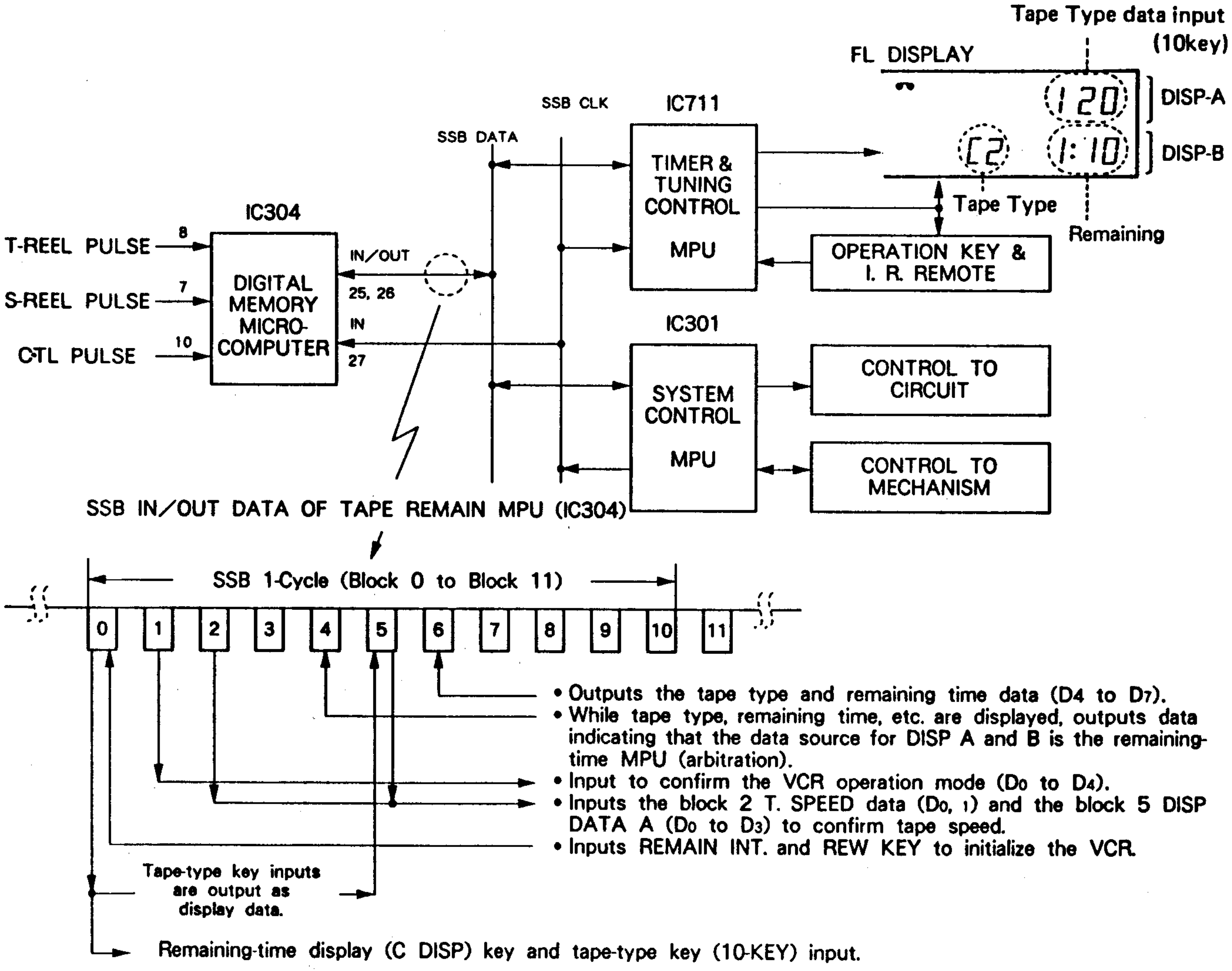
2-17-2. Table of MPU Pin Functions (IC304 : LC6521H-Series)

Pin No.	Name	Input/Output Signal	I/O	Input/Output Function
1	PG$_2$			Not used
2	PI$_0$	WTEST	I	This pin is used for the MPU working test (ON/$\overline{\text{OFF}}$). Normal tape remaining time calculation is performed when "low", and the testing operation when "high".
3	PI$_1$	PAL/NTSC	I	Signal for PAL/NTSC switching, recognized only when the MPU is reset.
4	PI$_2$	PAL 15/7	I	Input for PAL system LP mode F/R search speed commands. "high" for × 15 speed; "low" for × 7 speed.
5	PI$_3$	TAPE SPEED	I	Inputs tape speed data.
6	V$_{DD}$			+ 5V
7	PA$_0$	SUP	I	The reel pulse (12 pulses/rotation) generated by the supply reel rotation is input here. This input is used for calculating the supply reel rotation period. The pulse period required for recognition is approx. 3msec to 2sec.
8	PA$_1$	TAK	I	The reel pulse (12 pulses/rotation) generated by the take-up reel rotation is input here. This input is used for calculating the take-up reel rotation period. The pulse period required for recognition is approx. 3msec to 2sec.
9	PA$_2$	FL STOP SW	I	Signal for "cassette-in" recognition.
10	PA$_3$	CTL P.	I	Signal used for determining whether tape transport is stable while supply and take-up reel rotation periods are being measured for tape type recognition. The pulse period required for recognition is approx. 2msec.
11	PC$_0$	REMAIN ON	O	This signal becomes "high" for the MPU initialize calculation operation.
12	PC$_1$			Not used (Together with the PC0 at Pin 11, this pin outputs a pulse at periods of 80 to 120msec when WTEST input is "high").
13	PC$_2$			
14	PC$_3$			
15	PD$_0$			Not used
16	PD$_1$			
17	PD$_2$			
18	PD$_3$			
19	PE$_0$			
20	TEST			
21	V$_{SS}$			GND
22	OSC1			Supplies the MPU clock oscillation signal. Clock frequency is 4MHz.
23	OSC2			
24	$\overline{\text{RES}}$	$\overline{\text{RESET}}$	I	Reset input.
25	SI	S. IN	I	For data transmission with the SSB.
26	SO	S. OUT	O	
27	$\overline{\text{SCK}}$	S. CLK	I	Clock input from SSB.
28	$\overline{\text{INT}}$			Not used
29	PG$_0$			
30	PG$_1$			

Table 2-17-1

2-17-3. SSB Input/Output Data

As shown below, the remaining tape time calculating MPU (IC304) uses the SSB line to perform exchange of operation key data, operation mode data and other input data, as well as remaining time calculation results, tape type determining data and other output data, between the timer MPU (IC711) and the system control MPU (IC301). Blocks 0, 1, 2, 4, 5 and 6 in the figure are used for SSB data. For details on their contents, refer to each block's description in sections 2-3. through 2-9.


Tape Type data input
(10key)
FL DISPLAY
120
C2
1:10
DISP-A
DISP-B
Tape Type
Remaining
SSB CLK
SSB DATA
IC711
TIMER & TUNING CONTROL MPU
OPERATION KEY & I. R. REMOTE
IC304
T-REEL PULSE
S-REEL PULSE
CTL PULSE
8
7
10
DIGITAL MEMORY MICRO-COMPUTER
IN/OUT
25, 26
IN
27
IC301
SYSTEM CONTROL MPU
CONTROL TO CIRCUIT
CONTROL TO MECHANISM
SSB IN/OUT DATA OF TAPE REMAIN MPU (IC304)
SSB 1-Cycle (Block 0 to Block 11)
0
1
2
3
4
5
6
7
8
9
10
11
Tape-type key inputs are output as display data.

- Outputs the tape type and remaining time data (D_4 to D_7).
- While tape type, remaining time, etc. are displayed, outputs data indicating that the data source for DISP A and B is the remaining-time MPU (arbitration).
- Input to confirm the VCR operation mode (D_0 to D_4).
- Inputs the block 2 T. SPEED data ($D_{0,1}$) and the block 5 DISP DATA A (D_0 to D_3) to confirm tape speed.
- Inputs REMAIN INT. and REW KEY to initialize the VCR.

Remaining-time display (C DISP) key and tape-type key (10-KEY) input.

Fig. 2-17-2

2-17-4. Cassette Type Determination

Cassette type is automatically determined for cassettes bearing the "○" (AUTO ID) mark as shown in the table 2-17-2. For other cassettes, a precise remaining time reading can be obtained by entering the respective cassette number (example : input 195 for E195) with the numerical keys. First, press the C.DISP (Change Display) key. Then, enter the cassette number (see example above) with the numerical keys, and press the "→" key (this should be done while the cassette type indicator is flashing ; about 5 seconds).
Cassette type and remaining time are indicated on the lower row (DISP B) of the fluorescent display as shown in the figure. Cassette type indications differ according to tape speed (SP/LP) as shown in the table 2-17-2.

Auto ID	Cassette	Cassette number	Cassette type display	
			SP mode	LP mode
○	E-30	30	03	C1
○	E-60	60	C1	C2
○	E-90	90	09	C3
○	E-120	120	C2	C4
○	E-150	150	15	C5
○	E-180	180	C3	C6
	E-195	195	19	38
	E-210	210	21	C7
○	E-240	240	C4	C8

Table 2-17-2

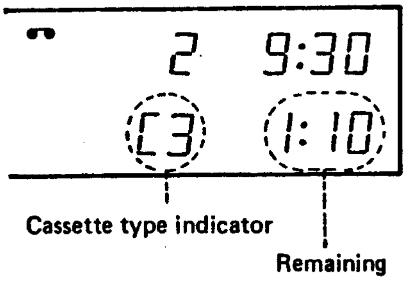
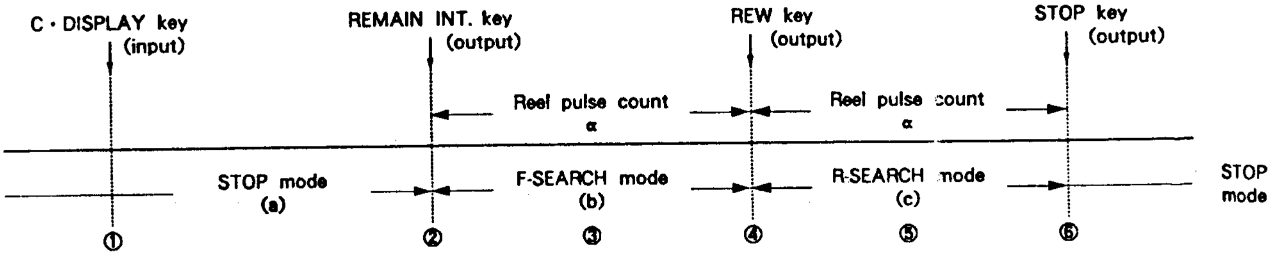


Fig. 2-17-3

2-17-5. Initialize Operation

The remaining tape calculating MPU is initialized when the cassette is replaced (removed and loaded again), and the internal remaining time value reset to zero. If a tape transport operation (playback, etc.) is performed in this condition, tape type determination and remaining time calculation are started. However, the following initialize operation can be performed before running the tape.

[Initialize Operation]
In the STOP mode, with no calculation result i the remaining tape calculating MPU and th fluorescent display showing the counter readin simply press the C.DISP key, and the followin initialize operation will be executed.



①Initialize operation starts when the C.DISP key is pressed under the above conditions.
②Upon receiving of the C.DISP key entry, the KEY RELEASE key and REMAIN INT. key signals are output.
③The reel pulse is counted since the F.SEARCH mode is set until remaining time calculation is finished.
④When remaining time calculation is finished the result is displayed, and simultaneously the KEY RELEASE key, NO KEY and REW key signals are output in succession.
⑤The reel pulse count starts again after entering the R-SEARCH mode.
⑥KEY RELEASE key and STOP key signals are output at the point where the reel pulse count in the R-SEARCH mode ("α" in the above figure) equals that in the F-SEARCH mode.

Fig. 2-17-4

2-18. TIMER AND TUNING CONTROL MPU (IC711)

2-18-1. Outline

This MPU confirms VCR operation key inputs, timer program key inputs, tuning operation key inputs and data input from the IR remote control, including the mentioned operations. VCR operation data are sent to the system control MPU through the SSB line, then operation control is performed. Tuner station selection is controlled by data signal connection of the MPU built-in digital voltage synthesizer or digital PLL tuning system circuit with the tuner block and the IF block.

VCR operating conditions are indicated by numerical figures or graphics on the 9-grid, 15-segment fluorescent display. The display signal (grid/segment) is output from this MPU by the dynamic indicating system. Furthermore, the display command is output not only from this MPU, also from the other MPUs through the SSB line.

Main functions are listed below.

- Timer programming : 8 programs/year
- VPS timer programming compat. : Max. 52-h standby
- Clock display : Displayed 24 hours a day
- Channel display : Numbers on 2 lines (position display), 39 positions
- Counter display : Switchable between linear time counter, remaining tape time and VASS address
- Search functions : GOTO search/INDEX search /Address search
- Special functions (key lock, etc.) compatibility
- Remote control decoder function : Timer programming, clock adjustment, special functions setting, search functions setting and setting of other standard functions by infrared transmission remote control.

A block diagram of the peripheral circuits of this MPU is given below.

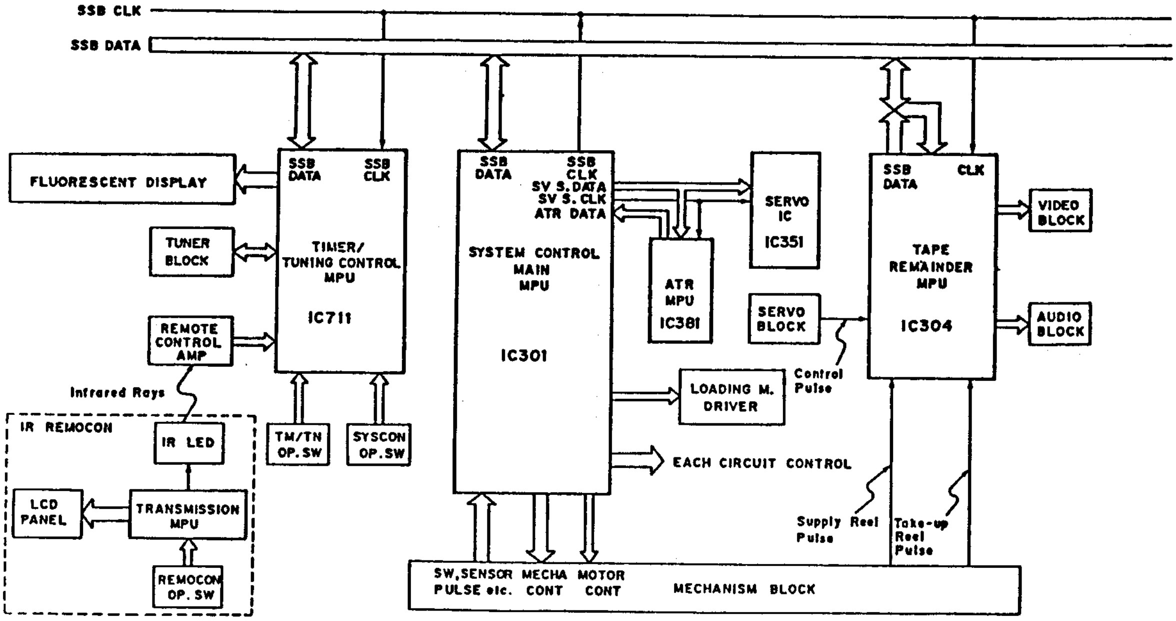

SSB CLK
SSB DATA
FLUORESCENT DISPLAY
TUNER BLOCK
REMOTE CONTROL AMP
Infrared Rays
IR REMOCON
IR LED
LCD PANEL
TRANSMISSION MPU
REMOCON OP. SW
SSB DATA
SSB CLK
TIMER/ TUNING CONTROL MPU
IC711
TM/TN OP. SW
SYSCON OP. SW
SSB DATA
SSB CLK
SV S. DATA
SV S. CLK
ATR DATA
SYSTEM CONTROL MAIN MPU
IC301
ATR MPU
IC381
SERVO IC
IC351
SERVO BLOCK
Control Pulse
LOADING M. DRIVER
EACH CIRCUIT CONTROL
SSB DATA
CLK
TAPE REMAINDER MPU
IC304
VIDEO BLOCK
AUDIO BLOCK
Supply Reel Pulse
Take-up Reel Pulse
SW, SENSOR PULSE etc.
MECHA CONT
MOTOR CONT
MECHANISM BLOCK

Fig. 2-18-1

2-18-2. MPU Pin Functions

a. Used for Voltage Synthesizer Tuning System Models (IC711 : M50957/M50959 series)

Pin No.	Name	Input/Output Signal	I/O	Input/Output Function
1	Vcc			+ 5V
2	$P6_5$	AV	O	"H" output when an external input is received.
3	$P6_4$	SC	O	"H" during simulcast.
4	$P6_3$/PWM3	BAND1	O	Band data output (BAND1, BAND2) (L, L) = VHF-LOW (L, H) = VHF-HIGH (H, L) = UHF (H, H) = SKIP
5	$P6_2$/PWM2	BAND2	O	
6	$P6_1$/PWM1	PWM	O	Tuning voltage output.
7	$P6_0$/T	ADJUST OSD CS	O	Pulse output (6.29MHz/128) for frequency adjustment. "L" output during ON-SCREEN IC selection.
8	$P2_7$	$\overline{\text{CLK}}$	O	Clock pulse output to the E^2 PROM or the OSD IC.
9	$P2_6$	DI	I/O	Data exchange with the E^2 PROM or the OSD IC.
10	$P2_5$	$\overline{E^2\ \text{PROM CS1}}$	O	E^2 PROM 1 is accessed when "L".
11	$P2_4$	BC/$\overline{\text{L}}$	O	Transmission system switching ("H" = PAL BC ; "L" = SECAM L).
12	$P2_3$	BLUE B. "H"	O	"H" output during blue back.
13	$P2_2$	TUNER ON	O	"H" output when tuner power is ON.
14	$P2_1$	$\overline{\text{AUDIO MUTE}}$	O	"L" output during AUDIO MUTE.
15	$P2_0$	AFT MUTE	O	"H" output during AFT MUTE.
16	$P3_7$/$\overline{\text{Srdy}}$	$\overline{E^2\ \text{PROM CS2}}$	O	E^2 PROM 2 (for titles) is accessed at "L" output.
17	$P3_6$/CLK	$\overline{\text{S.CLK}}$	I	SSB clock pulse input.
18	$P3_5$/Sout	$\overline{\text{S.OUT}}$	O	SSB data output.
19	$P3_4$/Sin	S.IN	I	SSB data input.
20	$P3_3$/ANin	AFT.C	I	AFT.S curve input.
21	$P3_2$/CNTR	H.SYNC	I	Horizontal sync signal input.
22	$P3_1$	SCL	O	Clock pulse output to the VPS decoder IC.
23	$P3_0$	SDA	I/O	Data exchange with the VPS decoder IC.
24	$P5_3$/INT_1	$\overline{\text{POWER DOUN}}$	I	Power failure mode set at "L" input.
25	$P5_2$/INT_2	REMOCON	I	Remote control signal input.
26	CNVss			Ground.
27	$\overline{\text{RESET}}$			Reset terminal.
28	Xin			6.291456MHz
29	Xout			
30	Xcin			32.768kHz (clock pulse used in the power failure mode)
31	Xcout			
32	Vss			Ground
33	ϕ			
34	$P5_7$	KEY IN4	I	Key inputs
35	$P5_6$	KEY IN3	I	
36	$P5_5$	KEY IN2	I	
37	$P5_4$	KEY IN1	I	
38	Vp	Vp		-30V
39	$P5_1$	STEREO R	O	"H" output when the STEREO R LED is lights up.
40	$P5_0$	STEREO L	O	"H" output when the STEREO L LED is lights up.
41	$P1_7$	o	O	Display segment outputs. (Included key-scan output)
42	$P1_6$	n	O	
43	$P1_5$	m	O	
44	$P1_4$	l	O	
45	$P1_3$	k	O	
46	$P1_2$	j	O	
47	$P1_1$	i	O	
48	$P1_0$	C9	O	Display grid outputs.
49	$P0_7$	C8	O	
50	$P0_6$	C7	O	
51	$P0_5$	C6	O	
52	$P0_4$	C5	O	
53	$P0_3$	C4	O	
54	$P0_2$	C3	O	
55	$P0_1$	C2	O	
56	$P0_0$	C1	O	
57	$P4_7$	h	O	Display segment outputs. (Included key-scan output)
58	$P4_6$	g	O	
59	$P4_5$	f	O	
60	$P4_4$	e	O	
61	$P4_3$	d	O	
62	$P4_2$	c	O	
63	$P4_1$	b	O	
64	$P4_0$	a	O	

Table 2-18-1 (a)

b. Used for PLL Frequency Synthesizer Tuning System Models (IC711 : M50959-102SP)

Pin No.	Name	Input/Output Signal	I/O	Input/Output Function
1	Vcc			+ 5V
2	$P6_5$	AV	O	"H" output when an external input is received.
3	$P6_4$	SC	O	"H" output during simulcast.
4	$P6_3$/PWM3	PLL CLK	O	PLL IC (TD6538N) clock pulse output.
5	$P6_2$/PWM2	PLL DATA	O	PLL IC (TD6538N) data output.
6	$P6_1$/PWM1	PLL CE	O	PLL IC (TD6538N) chip enable output.
7	$P6_0$/T	ADJUST	O	Pulse output for frequency modulation (6.29MHz/128).
8	$P2_7$	$\overline{\text{E}^2\text{ PROM CLK}}$	O	Clock pulse output to E^2 PROM.
9	$P2_6$	E^2 PROM D1	I/O	Data exchange with E^2 PROM.
10	$P2_5$	$\overline{\text{E}^2\text{ PROM CS}}$	O	E^2 PROM chip select output.
11	$P2_4$	BC/$\overline{\text{L}}$	O	Transmission system switching ("H" = PAL BC ; "L" = SECAM L).
12	$P2_3$			Not used.
13	$P2_2$	TUNER ON	O	"H" output when tuner power is ON.
14	$P2_1$	AUDIO MUTE	O	"L" output during audio mute.
15	$P2_0$			Not used.
16	$P3_7$/$\overline{\text{Srdy}}$			Not used.
17	$P3_6$/CLK	$\overline{\text{S.CLK}}$	I	SSB clock pulse input.
18	$P3_5$/Sout	$\overline{\text{S.OUT}}$	O	SSB data output.
19	$P3_4$/Sin	$\overline{\text{S.IN}}$	I	SSB data input.
20	$P3_3$/ANin	AFT-S	I	AFT-S curve input.
21	$P3_2$/CNTR	H-SYNC	I	Horizontal sync signal input.
22	$P3_1$	SCL	O	Clock pulse output to the VPS decoder IC.
23	$P3_0$	SOA	I/O	Data exchange with the VPS decoder IC.
24	$P5_3$/$\overline{\text{INT}_1}$	$\overline{\text{POWER DOUN}}$	I	Power failure mode set at "L" input.
25	$P5_2$/$\overline{\text{INT}_2}$	REMOCON	I	Remote control signal input.
26	CNVss			Ground.
27	$\overline{\text{RESET}}$			Reset terminal.
28	Xin			6.291456MHz (normal clock pulse)
29	Xout			
30	Xcin			32.768kHz (power failure backup clock pulse)
31	Xcout			
32	Vss			Ground
33	♦			
34	$P5_7$	KEI IN4	I	Key input
35	$P5_6$	KEI IN3	I	
36	$P5_5$	KEI IN2	I	
37	$P5_4$	KEI IN1	I	
38	VP			-30V
39	$P5_1$	STEREO R	O	"H" output when the STEREO R LED is lights up.
40	$P5_0$	STEREO L	O	"H" output when the STEREO L LED is lights up.
41	$P1_7$	o	O	Display segment outputs. (Included key-scan output)
42	$P1_6$	n	O	
43	$P1_5$	m	O	
44	$P1_4$	l	O	
45	$P1_3$	k	O	
46	$P1_2$	j	O	
47	$P1_1$	i	O	
48	$P1_0$	C9	O	Display grid outputs.
49	$P0_7$	C8	O	
50	$P0_6$	C7	O	
51	$P0_5$	C6	O	
52	$P0_4$	C5	O	
53	$P0_3$	C4	O	
54	$P0_2$	C3	O	
55	$P0_1$	C2	O	
56	$P0_0$	C1	O	
57	$P4_7$	h	O	Display segment outputs. (Included key-scan output)
58	$P4_6$	g	O	
59	$P4_5$	f	O	
60	$P4_4$	e	O	
61	$P4_3$	d	O	
62	$P4_2$	c	O	
63	$P4_1$	b	O	
64	$P4_0$	a	O	

Table 2-18-1 (b)

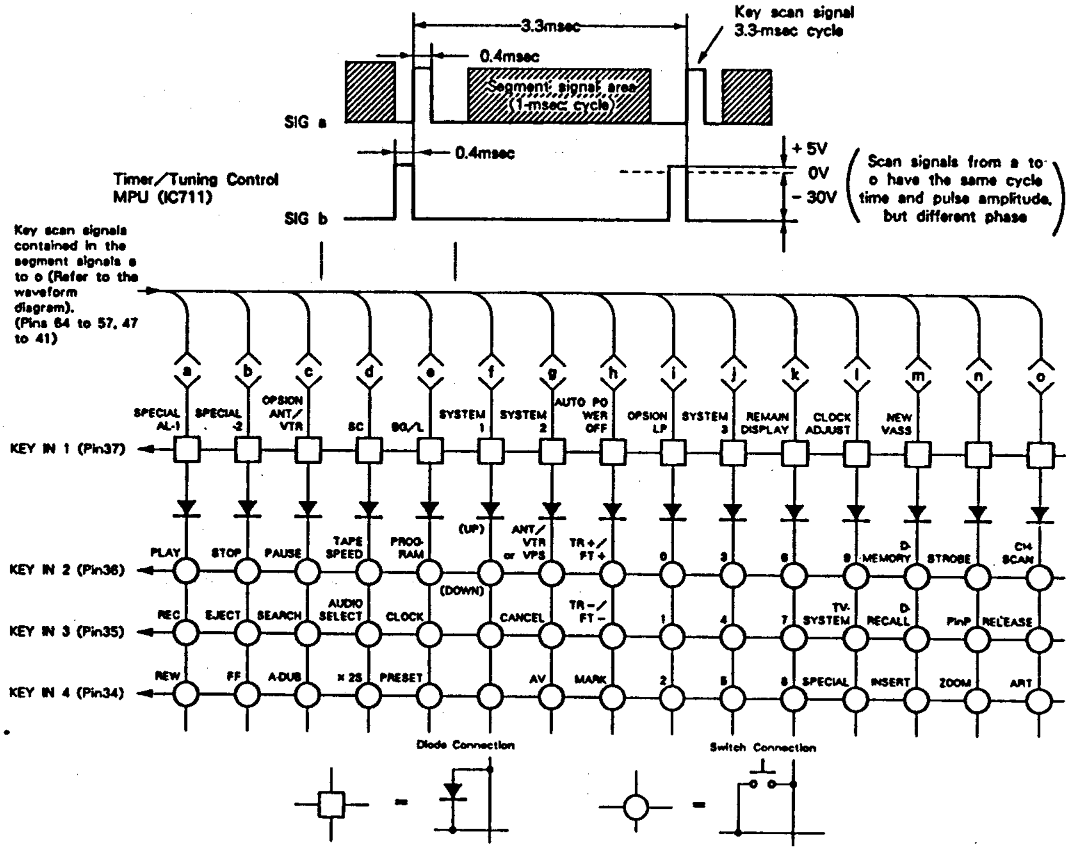
2-18-3. Input Functions of the Operation Keys

Key input recognition is performed through the input of the key scan signals selected at the key matrix circuit shown below to the respective KEY IN ports (0 to 3). The key scan signals, incorporated to the blanking period of the display segment signals (SIG a to o), have a pulse amplitude of 0.4msec, a cycle of 3.3msec, and are out of phase with regard to each other. Key input identification is performed on the basis of this phase difference.

KEY IN 0 (Pin 37), connected through a diode, is used for identification of the VCR functions. Namely, it is the function setting input for each model.

At this MPU, the result of key input recognition is converted to key data as shown in the SSB system BLOCK 0 (page 5), and the corresponding operation command is executed. Incidentally, IR remote control signals are also converted to BLOCK 0 key data after decoding.

Key Input Circuit



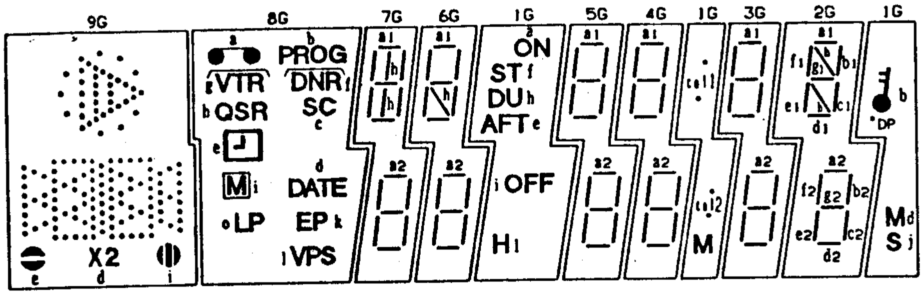
3.3msec
0.4msec
Key scan signal 3.3-msec cycle
Segment signal area (1-msec cycle)
SIG a
0.4msec
+5V
0V
-30V
Scan signals from a to o have the same cycle time and pulse amplitude, but different phase
Timer/Tuning Control MPU (IC711)
SIG b
Key scan signals contained in the segment signals a to o (Refer to the waveform diagram). (Pins 64 to 57, 47 to 41)
a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
SPECIAL AL-1
SPECIAL -2
OPSION ANT/ VTR
SC
BG/L
SYSTEM 1
SYSTEM 2
AUTO POWER OFF
OPSION LP
SYSTEM 3
REMAIN DISPLAY
CLOCK ADJUST
NEW VASS
KEY IN 1 (Pin37)
PLAY
STOP
PAUSE
TAPE SPEED
PROGRAM
(UP)
(DOWN)
ANT/ VTR or VPS
TR+/ FT+
0
3
6
9
D-MEMORY
STROBE
CH-SCAN
KEY IN 2 (Pin36)
REC
EJECT
SEARCH
AUDIO SELECT
CLOCK
CANCEL
TR-/ FT-
1
4
7
TV-SYSTEM
D-RECALL
PinP
RELEASE
KEY IN 3 (Pin35)
REW
FF
A-DUB
×2S
PRESET
AV
MARK
2
5
8
SPECIAL
INSERT
ZOOM
ART
KEY IN 4 (Pin34)
Diode Connection
Switch Connection

Fig. 2-18-2

2-18-4. Display Functions of the Fluorescent Display (FLD)

The fluorescent display has 9 grids and 15 segments, whose layout and connection are shown in the figure next page. The display outputs the signal corresponding to the segment to be lighted up, within the required grid pulse amplitude, according to the grid signals shown in the figure 2-18-5 (cycle 11msec, pulse amplitude 1msec, different phases as seen in the waveform diagram). This is referred to as the dynamic lighting system. For details on the segment signal, refer to the key scan signal waveform above Fig. 2-18-2.

1. GRID／SEGMENT ASIGMENT


9G
8G
7G
6G
1G
5G
4G
1G
3G
2G
1G
PROG
VTR
DNR
QSR
SC
DATE
LP
EP
VPS
X2
ON
ST
DU
AFT
OFF
H
M
M
S
DP

DISPLAY A／ (GRAPHIC)
(CH, CLOCK, TIMER & GRAPHIC)
(TAPE TYPE INPUT No.)

(DISPLAY B : DATE, TIMER, COUNTER, TAPE REMAIN)

PIN CONNECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
	F1	F1	NP	o	n	9G	m	l	k	j	8G	i	g	h	7G	NP	6G	NP	f	NP	NP	5G	NP	e	4G	d	NP	c	3G	b	2G	a	1G	NP	F2	F2

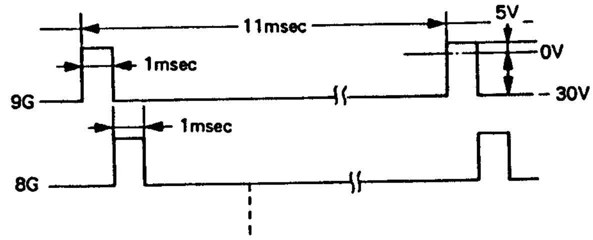
Fig. 2-18-3

2. ANODE CONNECTION

	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	B	● ●	a1	a1	a1	a1	a1	a1	ON
b	. A	PROG.	b1	b1	b1	b1	b1	b1	🌡
c	-	SC	c1	c1	c1	c1	c1	c1	DP
d	×2	DATE	d1	d1	d1	d1	d1	d1	M(1)
e	⊖	⊡	e1	e1	e1	e1	e1	e1	AFT
f	C	DNR	f1	f1	f1	f1	f1	f1	ST
g	D	VTR	g1	g1	g1	g1	g1	g1	col'1
h	-	OSR	/	\	-	-	-	\	DU
i	◍	[M]	a2	a2	a2	a2	a2	a2	OFF
j	E	-	b2	b2	b2	b2	b2	b2	S
k	I	EP	c2	c2	c2	c2	c2	c2	-
l	H	VPS	d2	d2	d2	d2	d2	d2	H
m	J	-	e2	e2	e2	e2	e2	e2	M(2)
n	F	-	f2	f2	f2	f2	f2	f2	-
o	G	LP	g2	g2	g2	g2	g2	g2	col'2

Table 2-18-2

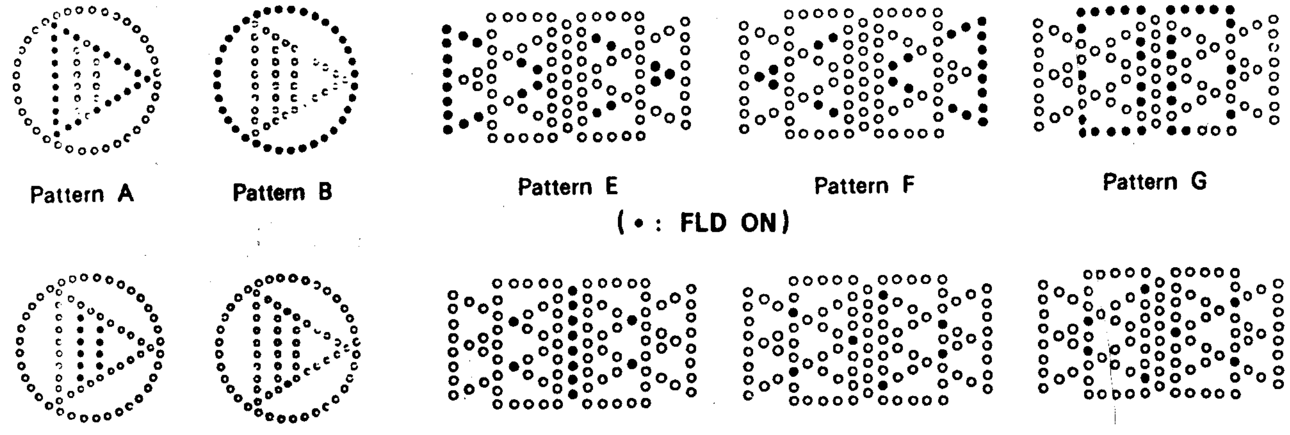
4. GRID SIGNAL WAVEFORM


11msec
5V
0V
-30V
1msec
1msec
9G
8G

(Gred signals from 1G to 9G have the same cycle time and pulse amplitude, but different phase.)

Fig. 2-18-5

3. 9G : GRAPHIC MODE DISPLAY


Pattern A
Pattern B
Pattern E
Pattern F
Pattern G
Pattern C
Pattern D
Pattern H
Pattern I
Pattern J

(• : FLD ON)

Fig. 2-18-4

2-18-5. Channel Selection Function

A basic circuit block diagram of the channel selection system is shown below. This system is composed of the following circuits, with the IC711 timer/tuning control MPU as its main part.

- KEY MATRIX : Channel selection command.
- FLUORESCENT (FL) DISPLAY : Shows channel selection results.
- EAROM (IC701) : Memorizes the selected channel data and tuning voltage data.
- BAND SELECTOR (IC702) : Converts 2-bit band data into 3-band (LB/HB/UB) signals.
- LPF (Q7001 peripheral circuit) : Converts to DC voltage the tuning voltage output as a PWM signal.
- AFT SWITCH : Turns the tuner AFT function ON and OFF.
- SYNC SEPARATOR (IC731) : Separates the selected channel video signal into horizontal and vertical sync signals. These sync signals are input to the tuning control MPU as channel presence/absence determining signals during channel selection.

The tuner is controlled through these peripheral circuits to execute channel selection.

Basic Circuit Block Diagram of the Channel Selection System

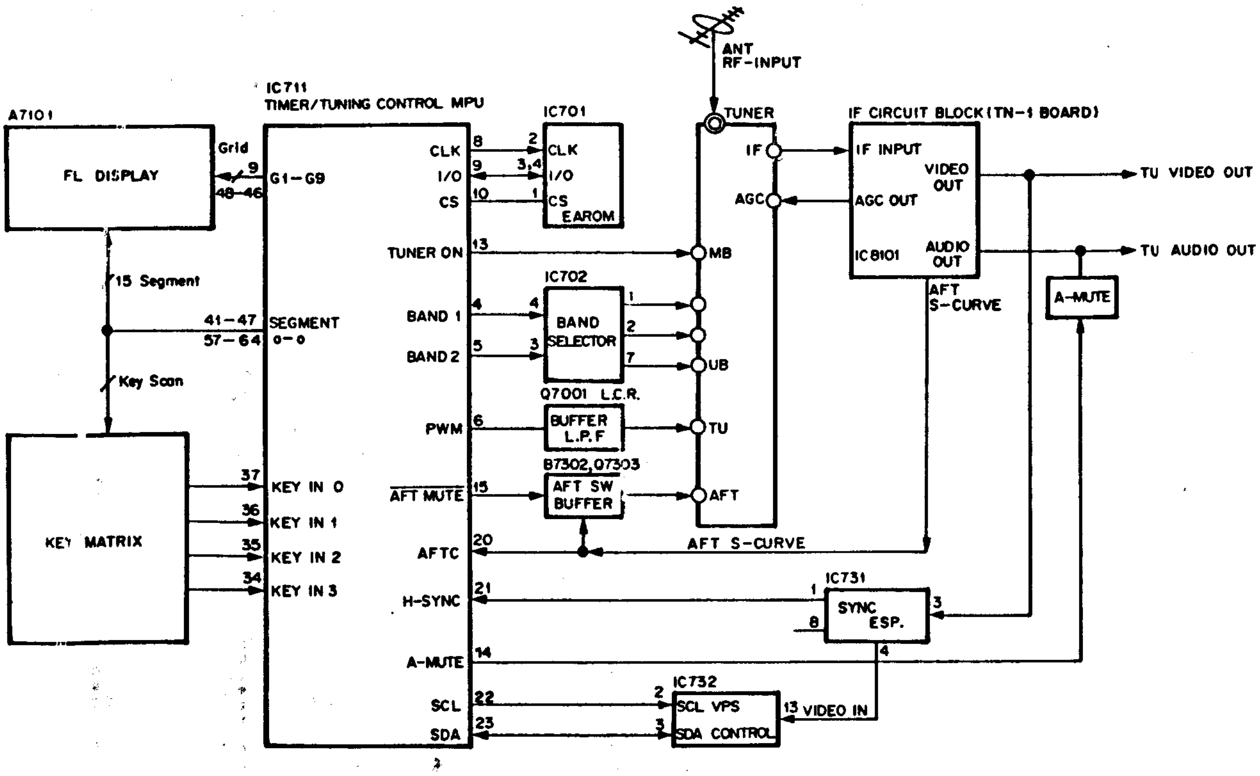

ANT
RF-INPUT
A7101
FL DISPLAY
Grid
9
48-46
G1-G9
15 Segment
41-47
57-64
SEGMENT
o-o
Key Scan
KEY MATRIX
37
36
35
34
KEY IN 0
KEY IN 1
KEY IN 2
KEY IN 3
IC711
TIMER/TUNING CONTROL MPU
CLK
I/O
CS
TUNER ON
BAND 1
BAND 2
PWM
AFT MUTE
AFTC
H-SYNC
A-MUTE
SCL
SDA
8
9
10
13
4
5
6
15
20
21
14
22
23
IC701
2
3,4
1
CLK
I/O
CS
EAROM
IC702
BAND SELECTOR
Q7001 L.C.R.
BUFFER
L.P.F
B7302,Q7303
AFT SW
BUFFER
TUNER
IF
AGC
MB
UB
TU
AFT
AFT S-CURVE
IF CIRCUIT BLOCK (TN-1 BOARD)
IF INPUT
VIDEO OUT
AGC OUT
IC8101
AUDIO OUT
AFT
S-CURVE
TU VIDEO OUT
TU AUDIO OUT
A-MUTE
IC731
SYNC
ESP.
IC732
SCL VPS
SDA CONTROL
13 VIDEO IN

Fig. 2-18-6

1. System Features

① Voltage synthesizer system, allowing for 39-position presetting.

② The SKIP condition can be memorized for each position.

③ Channel presetting is possible through the semi-auto search system.

④ Tuning voltage is shown on the fluorescent display (FLD) during presetting.

⑤ Equipped with fine tuning and fine tuning reset functions.

2. Tuning Operation for Presetting

When each channels are preset using the semi-auto search function, the optimum tuning point is automatically detected by the H-SYNC signal from Pin 21 and AFT.S curve signal from Pin 20 of the MPU.

The optimum tuning point is the area where the H-SYNC signal from Pin 21 is present and a descending slope of the AFT.S signal voltage curve crosses the range from 5/16 to 10/16 VDD as shown in the figure below.

[AFT.S curve voltage]

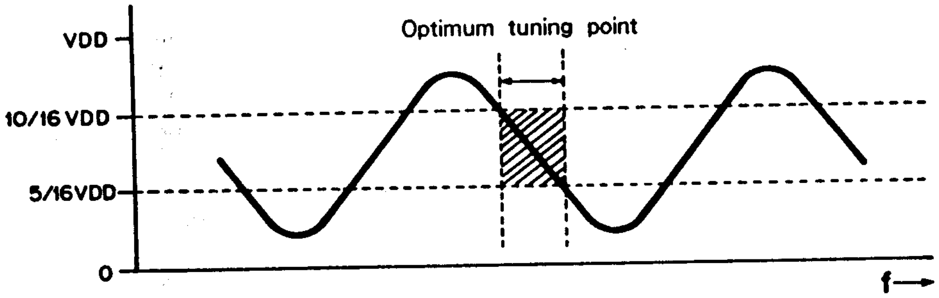


Fig. 2-18-7

Whether the selected channel is occupied or not by a station is determined by counting the H-SYNC signals separated from the video signal of the selected channel. H-SYNC signals are input to Pins 21 of the MPU. This causes only occupied channels to be preset.

Channel preset data (channel data, tuning voltage data, band data, skip data and AFT ON/OFF data) are memorized in the IC701 EAROM as the data corresponding to each position.

Normal channel selection is executed immediately by read-out of the ROM data in the position specified by key operation.

3. Band Data

Band data is output from the MPU in 2-bit units.

- Pin 4 : Band 1
- Pin 5 : Band 2

This 2-bit data is converted by IC702 into the respective VL/VH/U band signals shown in the table. Tuner band selection is performed by means of these signals.

	BAND 1	BAND 2
VL	L	L
VH	L	H
U	H	L

Table 2-18-3

3. VIDEO CIRCUIT SYSTEM

The video circuit is composed of IC101 (LA7322), which performs luminance signal (Y) recording and playback processing, and IC121 (TA8632), which performs chroma signal (C) recording and playback processing. These two ICs, mounted on the VD-1 board, constitute the the main Y/C circuit. Since the processed Y/C signal passes through the video head before being recorded on the tape, it should go through IC181 (VP-1 board), which includes a current amplifier circuit for recording. On the other hand, during playback the microsignal reproduced at the video head is preamplified at IC181 (VP-1 board) to a level that allows demodulation, then it passes through the switching circuit, which makes the playback signals of the each heads (channels 1 and 2) into a continuous signal, and it is sent to the above-mentioned Y/C processing circuit (VD-1 board).

3-1. LUMINANCE SIGNAL PROCESSING IC (IC101, LA7322)

Incorporating a detail enhancer, a line noise canceller, etc., this IC is compatible with the HQ (High Quality) system. It does not require E/E level and white/dark clip level adjustment, allowing for simpler peripheral circuits.

(1) Functions

Recording-related Functions

- Automatic gain control for the video input signal
- Detail enhancer (compatible with the HQ system)
- Nonlinear emphasis (OFF in the SP mode)
- Main emphasis
- White / dark clip (no adjustment required, compatible with the HQ system)
- Frequency modulation
- FM 1/2 fH carrier shift (OFF in the SP mode)

Playback-related Functions

- Automatic gain control for the playback FM signal
- Dropout compensation
- Double limiter for the FM signal
- Frequency demodulation
- Dynamic deemphasis
- Line noise canceller (combined with CCH 1H DL)
- Noise canceller
- Sync signal extension
- Y/C mix
- Mute or dummy V insertion
- White peak clip
- Picture control
- Playback dark clip

Functions Related to Both Recording and Playback

- Sync separation
- Sync tip clamp
- Feedback clamp (FBC)
- 75 Ω video output driver

(2) Main Peripheral Circuits of IC101 (LA7322)
Figs. 3-1 and 3-2 show the internal blocks of IC101 (LA7322) and the layout of its peripheral circuits for luminance signal processing, respectively.
The names of IC101 (LA7322) pins are listed on Table 3-1. Table 3-2 is an IC mode switching control table.

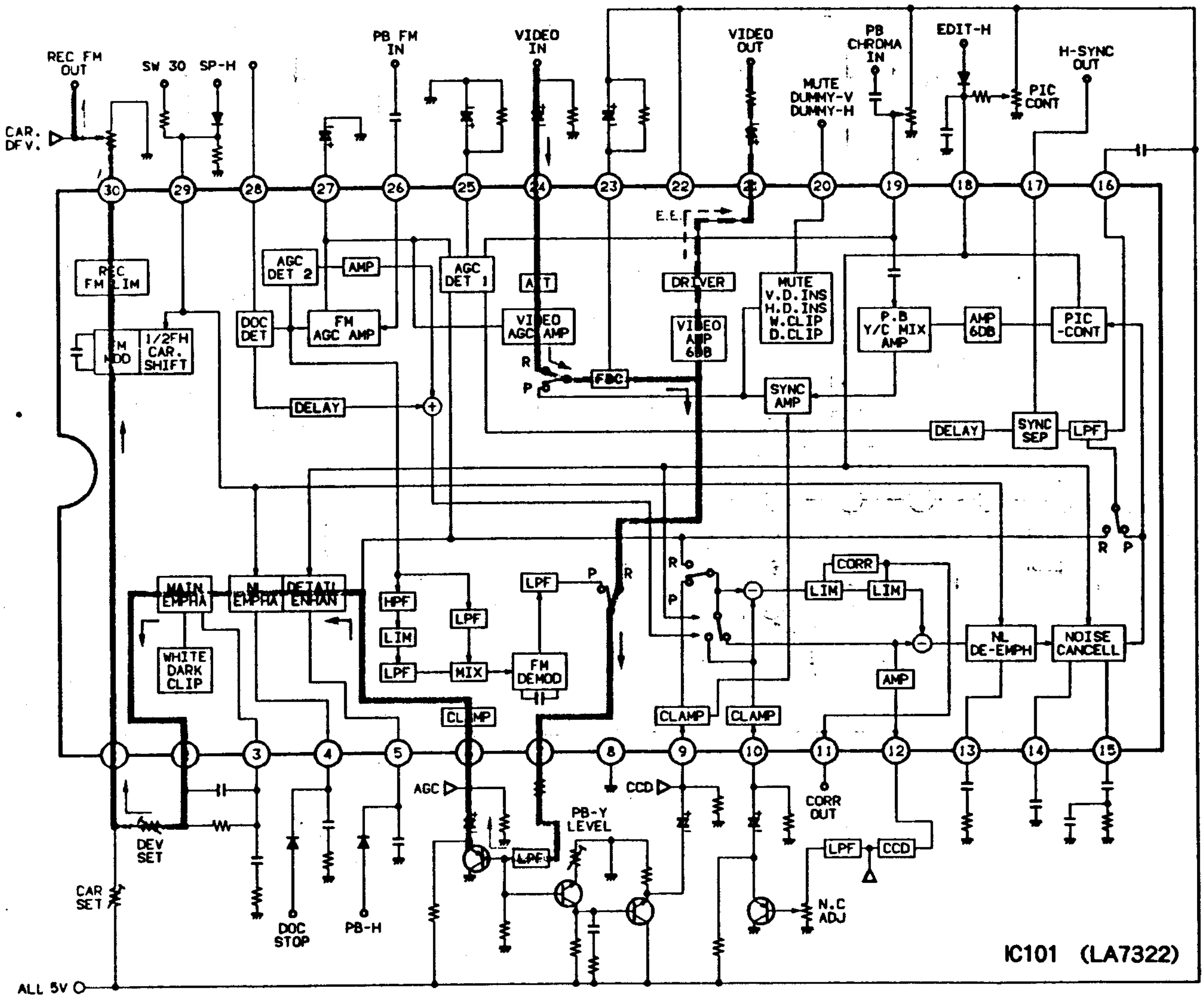

REC FM OUT
CAR. DEV.
SW 30
SP-H
PB FM IN
VIDEO IN
VIDEO OUT
PB CHROMA IN
MUTE DUMMY-V DUMMY-H
EDIT-H
PIC CONT
H-SYNC OUT
REC FM LIM
FM MOD
1/2FH CAR. SHIFT
DOC DET
AGC DET 2
AMP
FM AGC AMP
AGC DET 1
ATT
VIDEO AGC AMP
DRIVER
VIDEO AMP 6DB
E.E.
FBC
R
P
MUTE V.D.INS H.D.INS W.CLIP D.CLIP
SYNC AMP
P.B Y/C MIX AMP
AMP 6DB
PIC -CONT
DELAY
SYNC SEP
LPF
MAIN EMPHA
NL EMPHA
DETAIL ENHAN
WHITE DARK CLIP
HPF
LIM
LPF
MIX
FM DEMOD
CLAMP
CORR
LIM
NL DE-EMPH
NOISE CANCELL
AMP
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
AGC
CCD
PB-Y LEVEL
LPF
CORR OUT
LPF
CCD
N.C ADJ
DEV SET
CAR SET
DOC STOP
PB-H
ALL 5V
IC101 (LA7322)

Fig. 3-1 REC Mode

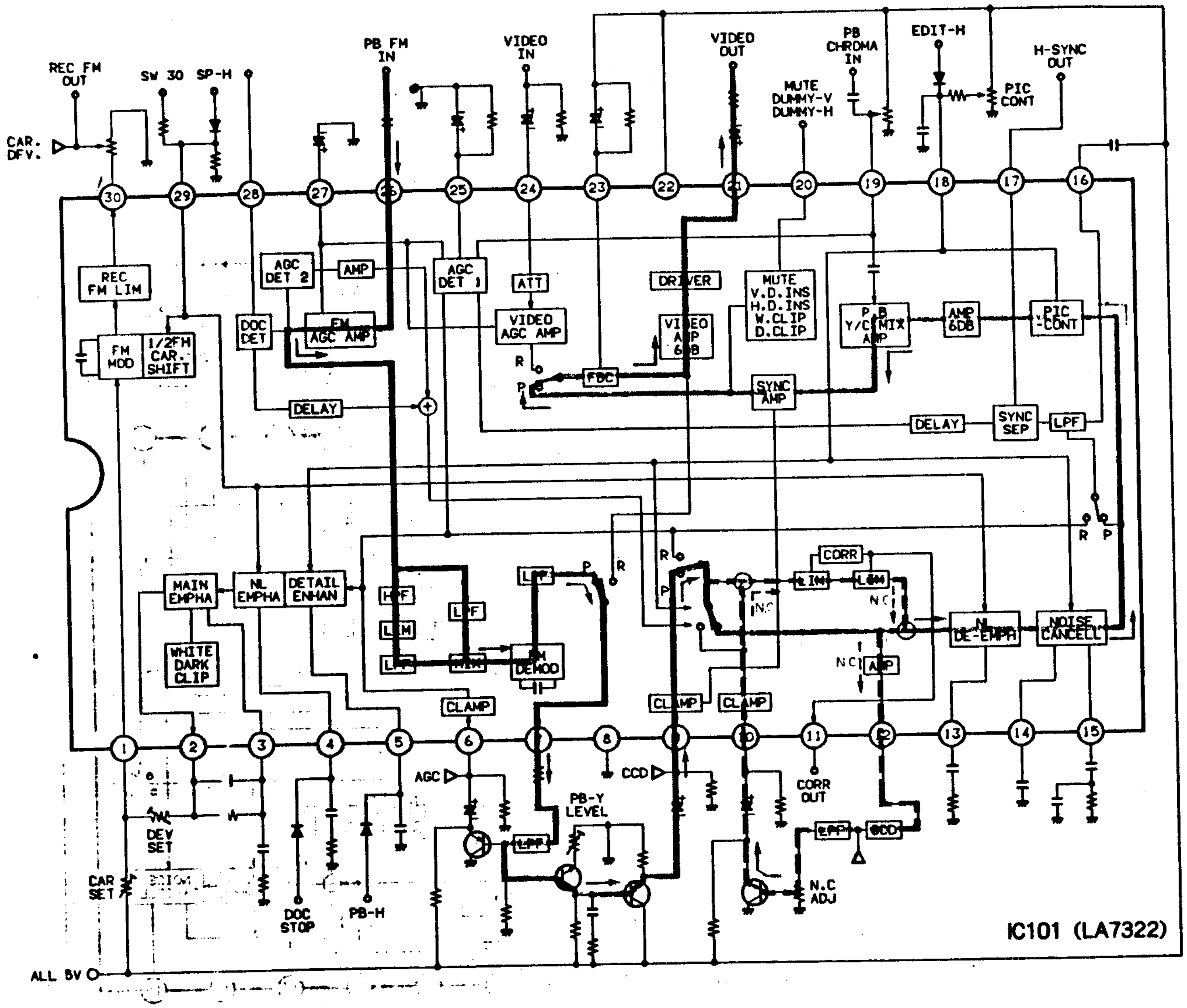

REC FM OUT
SW 30
SP-H
CAR. DEV.
PB FM IN
VIDEO IN
VIDEO OUT
PB CHROMA IN
MUTE DUMMY-V DUMMY-H
EDIT-H
PIC CONT
H-SYNC OUT
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
REC FM LIM
FM MOD
1/2FH CAR. SHIFT
DOC DET
AGC DET 2
AMP
FM AGC AMP
AGC DET 1
ATT
VIDEO AGC AMP
R
P
FBC
DRIVER
VIDEO AMP 6dB
MUTE V.D.INS H.D.INS W.CLIP D.CLIP
SYNC AMP
P.B Y/C MIX AMP
AMP 6DB
PIC CONT
DELAY
DELAY
SYNC SEP
LPF
R
P
MAIN EMPHA
NL EMPHA
DETAIL ENHAN
WHITE DARK CLIP
HPF
LIM
LPF
LPF
MIX
FM DEMOD
LPF
P
R
R
P
CORR
LIM
LIM
N.C
N.C
N.C
AMP
NL DE-EMPH
NOISE CANCELL
CLAMP
CLAMP
CLAMP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
AGC
CCD
CORR OUT
DEV SET
CAR SET
DOC STOP
PB-H
PB-Y LEVEL
LPF
LPF
CCD
N.C ADJ
ALL 5V
IC101 (LA7322)

Fig. 3-2 PB Mode

IC101 (LA7322) Terminal Name

Pin No.	Terminal Name	Pin No.	Terminal Name
1	Y-FM MODULATOR IN	16	SYNC SEPARATOR FILTER
2	PRE EMPHASIS OUT	17	H SYNC OUT
3	MAIN EMPHASIS FEEDBACK	18	PICTURE CONTROL
4	NL EMPHASIS FILTER	19	PB CHROMA IN
5	DETAIL FILTER	20	MUTE, DUMMY-V, DUMMY-H
6	REC CLAMP IN	21	VIDEO OUT
7	REC AGC OUT, PB DEMODULATOR OUT	22	Vcc
8	GND	23	FBC FILTER
9	PB CLAMP IN	24	VIDEO IN
10	YD CLAMP IN	25	AGC
11	CORRELATION DETECT OUT	26	PB Y-FM IN
12	CCD DRIVE	27	AGC
13	NL DE-EMPHASIS FILTER	28	DOC DETECT OUT
14	NOISE CANCEL FILTER-1	29	SP-H, SW30
15	NOISE CANCEL FILTER-2	30	REC Y-FM OUT

Table 3-1.

IC101 (LA7322) Mode Switching Control Table

Pin No.	Mode	L	M	H
4	DOC STOP	DOC ON	–	DOC OFF 3.6V OVER
5	R/P Mode	REC Mode	–	PB Mode 3.9V OVER
18	EDIT Mode	EDIT OFF	–	EDIT ON 3.6V OVER
20	MUTE	NORMAL 1.5V UNDER	Pedestal Mute 1.9 to 3.2V	SYNC TIP Mute 3.6V OVER
29	TAPE SPEED	EP Mode 1.6V UNDER	–	SP MODE 2.0V OVER

Table 3-2.

3-2. CHROMA SIGNAL PROCESSING CIRCUIT

IC121 (TA8632) is a playback/recording for VHS system chroma signals, Processing IC.

This IC contains all of the basic recording/playback functions for the chroma signal processing system, and this single chip performs all chroma signal recording/playback processing for the various TV broadcast systems (NTS, PAL and SECAM).
The internal block diagram of IC121 is shown in Fig. 3-3 as well as the peripheral circuit configuration for chroma signal processing. The terminal specifications of IC121 and IC mode select control tables are shown in Tables 3-3 through 3-4.

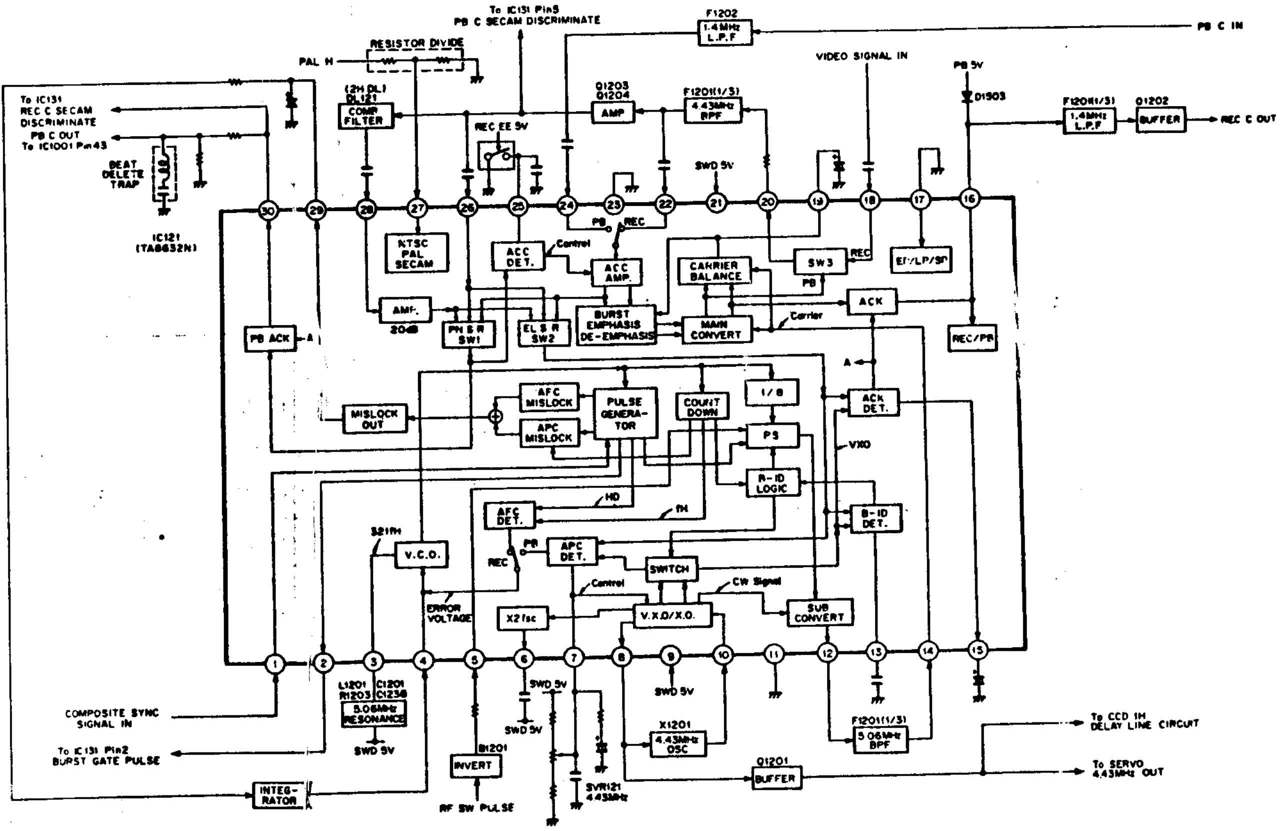

To IC131 Pin5
PB C SECAM DISCRIMINATE
RESISTOR DIVIDE
PAL H
F1202
1.4MHz L.P.F
PB C IN
To IC131
REC C SECAM
DISCRIMINATE
PB C OUT
To IC1001 Pin43
BEAT DELETE TRAP
(2H DL)
DL121
COMP FILTER
REC EE 5V
Q1203
Q1204
AMP
F1201(1/3)
4.43MHz BPF
VIDEO SIGNAL IN
PB 5V
D1503
F1201(1/3)
1.4MHz L.P.F
Q1202
BUFFER
REC C OUT
SWD 5V
IC121
(TA8632N)
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
PB
REC
NTSC PAL SECAM
ACC DET.
Control
ACC AMP.
CARRIER BALANCE
SW3
REC
PB
EP/LP/SP
AMP.
20dB
PN S R SW1
EL S R SW2
BURST EMPHASIS DE-EMPHASIS
MAIN CONVERT
Carrier
ACK
PB ACK
A
REC/PB
A
AFC MISLOCK
APC MISLOCK
MISLOCK OUT
PULSE GENERATOR
COUNT DOWN
1/8
ACK DET.
PS
VXO
R-ID LOGIC
HD
fH
AFC DET.
B-ID DET.
321fH
V.C.O.
PB
REC
APC DET.
SWITCH
Control
CW Signal
ERROR VOLTAGE
X2 fsc
V.X.O/X.O.
SUB CONVERT
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
COMPOSITE SYNC SIGNAL IN
L1201
R1203
C1201
C1236
5.06MHz RESONANCE
SWD 5V
To IC131 Pin2
BURST GATE PULSE
SWD 5V
SWD 5V
R1201
INVERT
RF SW PULSE
INTEG-RATOR
SVR121
4.43MHz
SWD 5V
X1201
4.43MHz OSC
Q1201
BUFFER
F1201(1/3)
5.06MHz BPF
To CCD 1H DELAY LINE CIRCUIT
To SERVO 4.43MHz OUT

Fig. 3-3.

[IC121 terminal characteristics]

Terminal		Standard DC voltage	Input/output impedance	Standard AC voltage	Remarks	Terminal		Standard DC voltage	Input/output impedance	Standard AC voltage	Remarks
No.	Name					No.	Name				
1	Composite sync signal input	—	40 kΩ	High 4.7V Low 0V	Sync: positive pulse VCO reference signal	16	REC: chrome out PB: select in	2.4V (ACK: 0V) 4.0V or higher: PB mode	30 Ω	Burst signal 600m Vp-p	Sink current: 1.0 mA
2	Burst gate pulse output	—	Open omitter	High 4.3V Low 1.3V	Sync: negative pulse	17	EP/LP/SP select input	EP: 5V LP: 2.5V SP: 0V	50 kΩ or higher (open base)	—	Controls SW1 burst emphasis
3	V.C.O. time constant	—	10 kΩ	430 mVp-p	Collector output	18	REC video signal input	2.5V	20 kΩ	Composite video signal 1Vp-p	Differentiation input
4	V.C.O. control filter	2.4V	10 kΩ when gate; other: current drive	—	With clamp (HIGH 3.4V) (LOW 1.6V)	19	DC feedback filter	2.9V	Current drive	—	For ACC amp., main convert, DC balance adj.
5	Color rotary pulse input	—	40 kΩ	High 4.7V Low 0V	CH1: High CH2: Low	20	B.P.F. drive output	2.3V	SEPP	Burst signal 300 mVp-p	REC: Chroma + ΔY PB: 4.21MHz ± 629kHz
6	X2 Isc output	—	4 kΩ	0.6 Vp-p	Collector output	21	Vcc 2	(5.0V)	—	—	ACC, Main convert, Chrome output system
7	V.X.O. control filter	2.4V	10 kΩ when gate; other: current drive	—	With clamp (HIGH 3.4V) (LOW 1.6V)	22	REC chrome signal input	2.7V	20 kΩ	Burst signal 150 mVp-p	—
8	V.X.O. output	—	30 Ω	1.2 Vp-p	Sink current: 1.0mA	23	GND 2	—	—	—	ACC, Main convert, Chrome output system
9	Vcc 1	(5.0V)	—	—	For VCO, VXO, sub convert, B-ID, logic	24	PB chroma signal input	2.7V	20 kΩ	Burst signal 150 mVp-p	—
10	V.X.O. input	3.1V	—	0.3 Vp-p	—	25	ACC filter	—	Current drive	—	With clamp (HIGH 3.8V) (LOW 2.2V)
11	GND 1	—	—	—	For VCO, VXO, sub convert, B-ID, logic	26	Chroma signal input 1	2.4V	10 kΩ	Burst signal 300 mVp-p	—
12	Sub converter output	4.4V	1 kΩ	1.2Vp-p	Collector output	27	NTSC/PAL/SECAM select input	NTSC: 5.0V SECAM: 2.5V PAL: 0V	50 kΩ or higher (open base)	—	—
13	Burst-ID filter	3.0V	5 kΩ	1.6 Vp-p	—	28	Chroma signal input 2	2.7V	20 kΩ	Burst signal 38 mVp-p	—
14	Conversion carrier input	2.7V	1 kΩ	240 mVp-p	—	29	Mislock filter	—	Current drive	—	—
15	ACK filter	2.2V	10 kΩ when gate; other; current drive	—	HIGH: ACK OFF LOW: ACK ON	30	Chroma signal output	2.7V (PB ACK: 0V)	30 Ω	Burst signal 300 mVp-p	Sink current: 1.0mA

Note: Characteristics of terminals may vary depending on the Vcc voltage used and other conditions.
The characteristics in the above table are standard values at Vcc = 5V and Tn = 25° C.

Table 3-3.

[IC121 mode select control table]

Mode select Note 2			Mode status			
V_{16}	V_{27}	V_{17}				
H	H	H	NTSC playback mode • 320 f_H VCO is controlled by APC loop.	SW1 is connected to output side of comb filter (pin-28)	SW2 : connected to output side of comb filter (pin-28)	With burst de-emphasis
		M				No burst de-emphasis
		L			SW2 : connected to input side of comb filter (pin-26)	With burst de-emphasis
	M	H	SECAM playback mode • APC loop only	SW1 is connected to input side of comb filter (pin-26)	Status of SW2 is not important in SECAM mode	No burst de-emphasis
		M				
		L				
	L	H	PAL playback mode • 321 f_H is controlled by APC loop. • The reference signal to B-ID and APC loop is reversed every 1H.	SW1 is connected to output side of comb filter (pin-28)	SW2 : connected to output side of comb filter (pin-28)	
		M				
		L			SW2 : connected to input side of comb filter (pin-26)	
L (open) Note 1	H	H	NTSC recording mode • Controlled by AFC, APC loop system	SW1 and SW2 are connected to ACC amplifier side		With burst emphasis
		M				No burst emphasis
		L				With burst emphasis
	M	H	SECAM recording mode • AFC loop only			No burst emphasis
		M				
		L				
	L	H	PAL recording mode • Controlled by AFC, APC loop system • The reference signal to B-ID and APC loop is reversed every 1H.			
		M				
		L				

Note 1: Also low-range conversion chroma output terminal for recording.

Note 2: V_{16}, V_{27}, and V_{17} indicate the voltage levels of IC121 pin-16, pin-27, and pin-17 respectively.

Note 3: The voltage levels of V_{27} and V_{17} are as follows:

H level : 5V
M level : 2V
L level : 0V

Note 4: The NTSC mode is not used in this model.

Table 3-4.

3-3. SECAM DISCRIMINATION CIRCUIT

The SECAM discrimination circuit is shown in Fig. 3-4. The SECAM discrimination circuit is for areas in which PAL system and pseudo-SECAM (ME-SECAM) system television broadcasts can be received.

For countries which have only PAL system television broadcasts (such as the UK) and countries which have true SECAM (SECAM L) broadcasts (such as France), refer to the circuit diagrams and operational descriptions of models capable of receiving these television broadcasts.

The 3-3. SECAM Discrimination Circuit is omitted from VCR models for areas in which only PAL system television broadcasts are made, and this section is unnecessary.

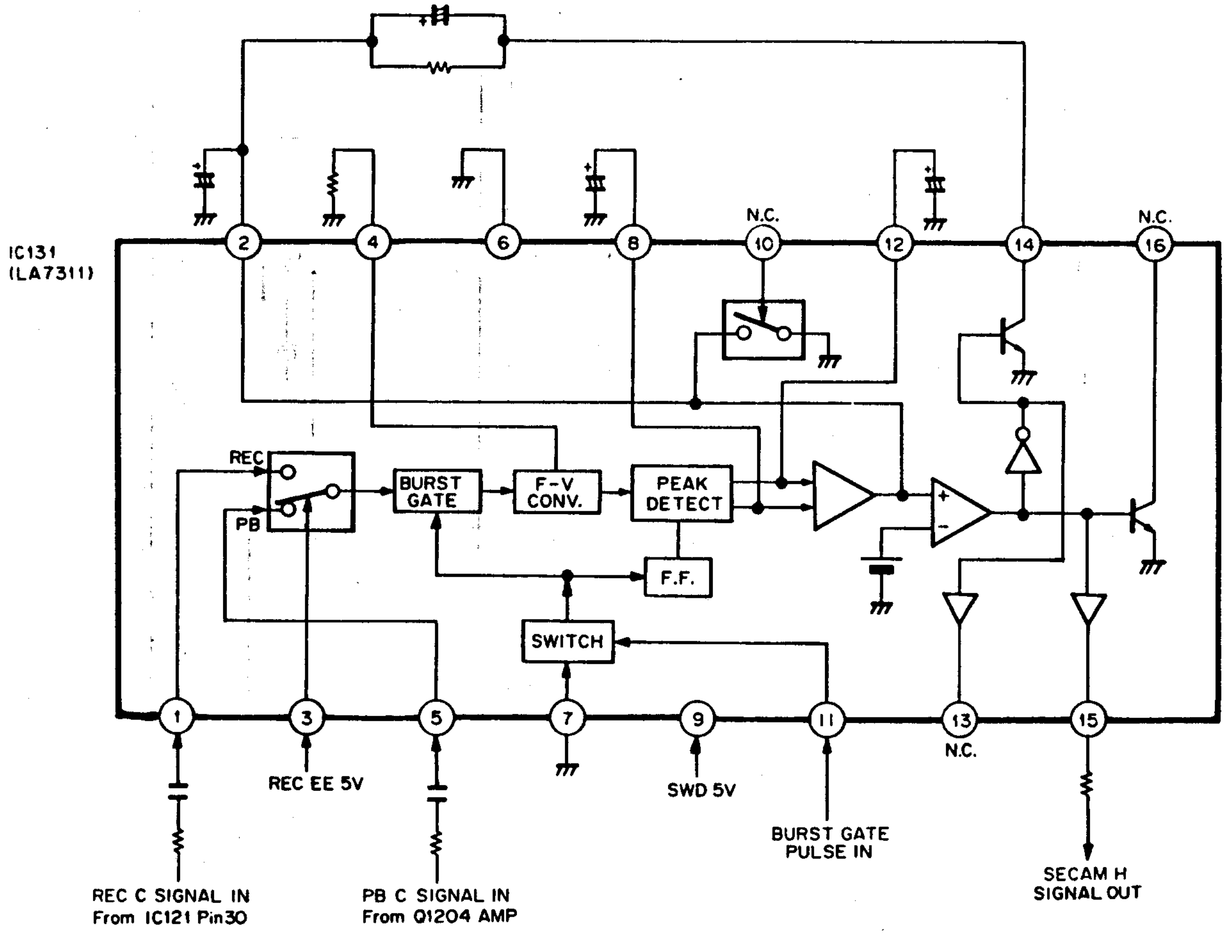

IC131
(LA7311)
N.C.
N.C.
2
4
6
8
10
12
14
16
REC
PB
BURST GATE
F-V CONV.
PEAK DETECT
F.F.
SWITCH
1
3
5
7
9
11
13
15
N.C.
REC EE 5V
SWD 5V
BURST GATE PULSE IN
REC C SIGNAL IN
From IC121 Pin30
PB C SIGNAL IN
From Q1204 AMP
SECAM H
SIGNAL OUT

Fig. 3-4.

[Terminal names of IC131]

Pin No.	Terminal Name	Pin No.	Terminal Name
1	REC CHROMA INPUT	9	Vcc
2	SECAM HOLDER	10	PAL HIGH IN
3	REC/PB CONTROL IN	11	$\overline{\text{BGP}}$ IN
4	CURRENT SOURCE	12	PEAK FILTER (2)
5	PB CHROMA INPUT	13	PAL HIGH OUT
6	GND	14	PAL DRIVE
7	BGP IN	15	SECAM HIGH OUT
8	PEAK FILTER (1)	16	SECAM DRIVE

Table 3-5.

The main portion of the SECAM discrimination circuit are used IC (LA7311) in this model. The SECAM discrimination circuit extracts the burst signal (or H-ID signal) from the chroma signal and detects whether there is a difference every 1H (1 horizontal synchronization period). This determines whether the signal is SECAM system (4.25MHz or 4.41MHz) or PAL system (4.43MHz) and outputs a signal to the chroma signal processing IC (TA8632) to select the proper mode for this IC.

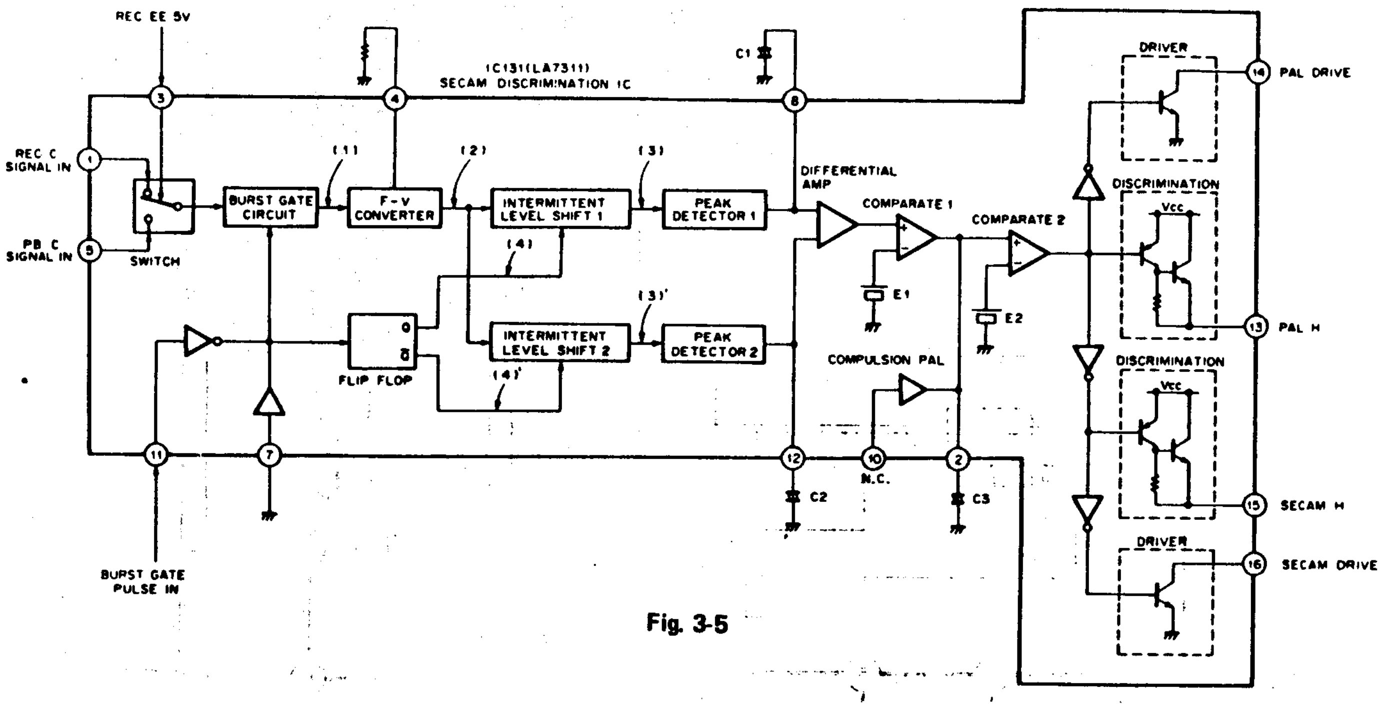

REC EE 5V
IC131(LA7311)
SECAM DISCRIMINATION IC
C1
REC C SIGNAL IN
PB C SIGNAL IN
SWITCH
BURST GATE CIRCUIT
F-V CONVERTER
INTERMITTENT LEVEL SHIFT 1
PEAK DETECTOR 1
INTERMITTENT LEVEL SHIFT 2
PEAK DETECTOR 2
FLIP FLOP
Q
Q̄
(1)
(2)
(3)
(4)
(3)'
(4)'
BURST GATE PULSE IN
1
2
3
4
5
7
8
10
11
12
13
14
15
16
DIFFERENTIAL AMP
COMPARATE 1
COMPARATE 2
E1
E2
COMPULSION PAL
N.C.
C2
C3
DRIVER
DISCRIMINATION
Vcc
DISCRIMINATION
Vcc
DRIVER
PAL DRIVE
PAL H
SECAM H
SECAM DRIVE

Fig. 3-5

4. SERVO CIRCUIT

The rotation servocontrol circuit for the drum and capstan motors is mainly composed of a digital servo IC (LC7417/18), with a built-in control data ROM, and the control-signal amplifier IC (LA7122S). The master servocontrol circuit consists of the speed control circuit and the phase control circuit. The motor servodrive voltage is produced by combining the signals generated by these two circuits. Servocontrol allows for obtaining a stable recording or playback picture.

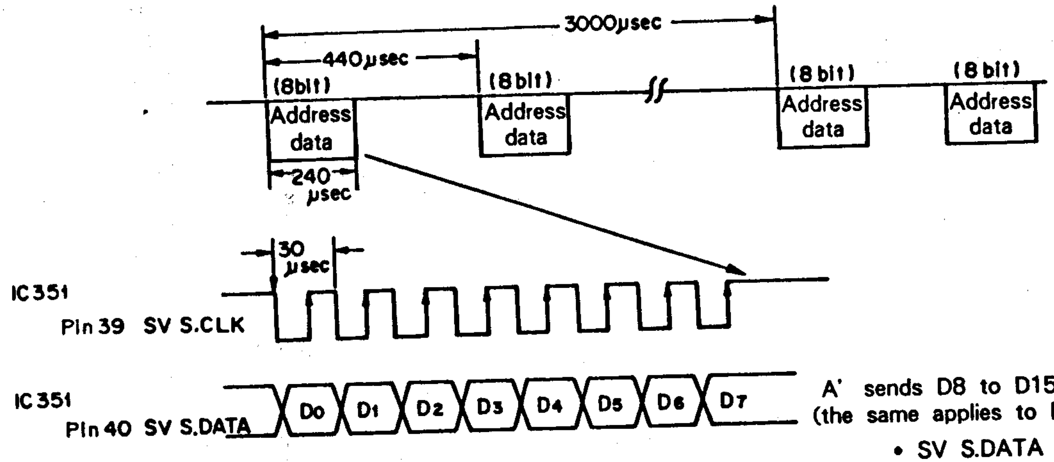
The speed control circuit compares the FG signal frequency, which indicates motor rotation information, with the set frequency data stored in the IC internal ROM, thus obtaining the control error voltage. On the other hand, the phase control circuit compares the phase of the PG/FG signals, which carry motor rotation information, or the playback control signal, with the phase of the reference signal, then calculates the difference between the time difference encountered and the set time-difference data stored in the IC internal ROM, thus obtaining the control error voltage. The speed control circuit and phase control circuit error voltages are combined at the differential amplifier, then supplied to the motor driving circuits as motor servodrive voltage.

(1) Functions of the Digital Servo IC (IC351, LC7417/18)

- Head drum motor system speed/phase control (built-in ROM)
- Capstan motor system speed/phase control (built-in ROM)
- Generation of reference signal for phase control (built-in ROM)
- Internal mode control by 16-bit serial data
- Automatic tape speed discrimination for playback (EP/LP/SP) (PAL: LP/SP)
- Generation of head switching signal for 4-head /3-head models
- Generation of audio head (AF) switching signal for Hi-Fi models
- Frame advance (intermittent slow) timing control
- Generation of dummy VD during special playback
- Head servo fH compensation during special playback
- Digital tracking delay circuit
- Tracking (X value) compensation circuit
- Recording control signal duty ratio switching for VISS/VASS function
- Playback control signal duty ratio detection for VISS/VASS function
- Compatible with both NTSC and PAL systems

(2) Servo Circuit Mode Control

The servo circuit operation mode is set by the mode control signal input to this digital servo IC (IC351). This mode control signal is the SV S.DATA signal output as serial data from the system control MPU (IC301). Its form and data contents are shown below.



A' sends D8 to D15
(the same applies to B address data)

- SV S.DATA sending timing

Fig. 4-1.

SV S.DATA are the basic servo circuit control data, including, as shown in the table, the MODE-D0 to D3 data, which set the operation mode, the F/R data, which switches between forward and reverse operation of the capstan motor, the TS-CNT 0 to 2 data, which indicate tape speed, the CAP-ON data, which starts and stops the capstan motor, and the DRUM-ON data, which starts and stops the drum motor.

A feature of this digital servo IC is that tracking delay is also controlled by the TRK-DATA 0 to 6 included in the SV S.DATA. This allows digital tracking control for higher reliability, and also allows to use the auto tracking function by adding an ATR (auto tracking) MPU (IC381) to the system control circuit.

For details on the SV S.DATA signal, refer to the main output signals description in section 2-15. SYSTEM CONTROL MPU (IC301), paragraph (3).

[Contents of SV S.DATA]

	A Address Data	B Address Data
D0	MODE – D0	TRK – DATA0
D1	MODE – D1	TRK – DATA1
D2	MODE – D2	TRK – DATA2
D3	MODE – D3	TRK – DATA3
D4	F/R	TRK – DATA4
D5	TS – CNT0	TRK – DATA5
D6	TS – CNT1	TRK – DATA6
D7	TS – CNT2	SLOW/NORM
	A' Address Data	B' Address Data
D8	CAP – ON	CTL – DUTY
D9	DRUM – ON	REMARK
D10	ENV – ON	ATR ON
D11	VD – ON	STILL/SLOW
D12	*	*
D13	F – ADV – P	*
D14	*	*
D15	Address identification "1"	Address identification "0"

* : Not used

Table 4-1.

(3) Layout of Digital Servo IC (IC351) and Servo Amplifier IC (IC352) Peripheral Circuits

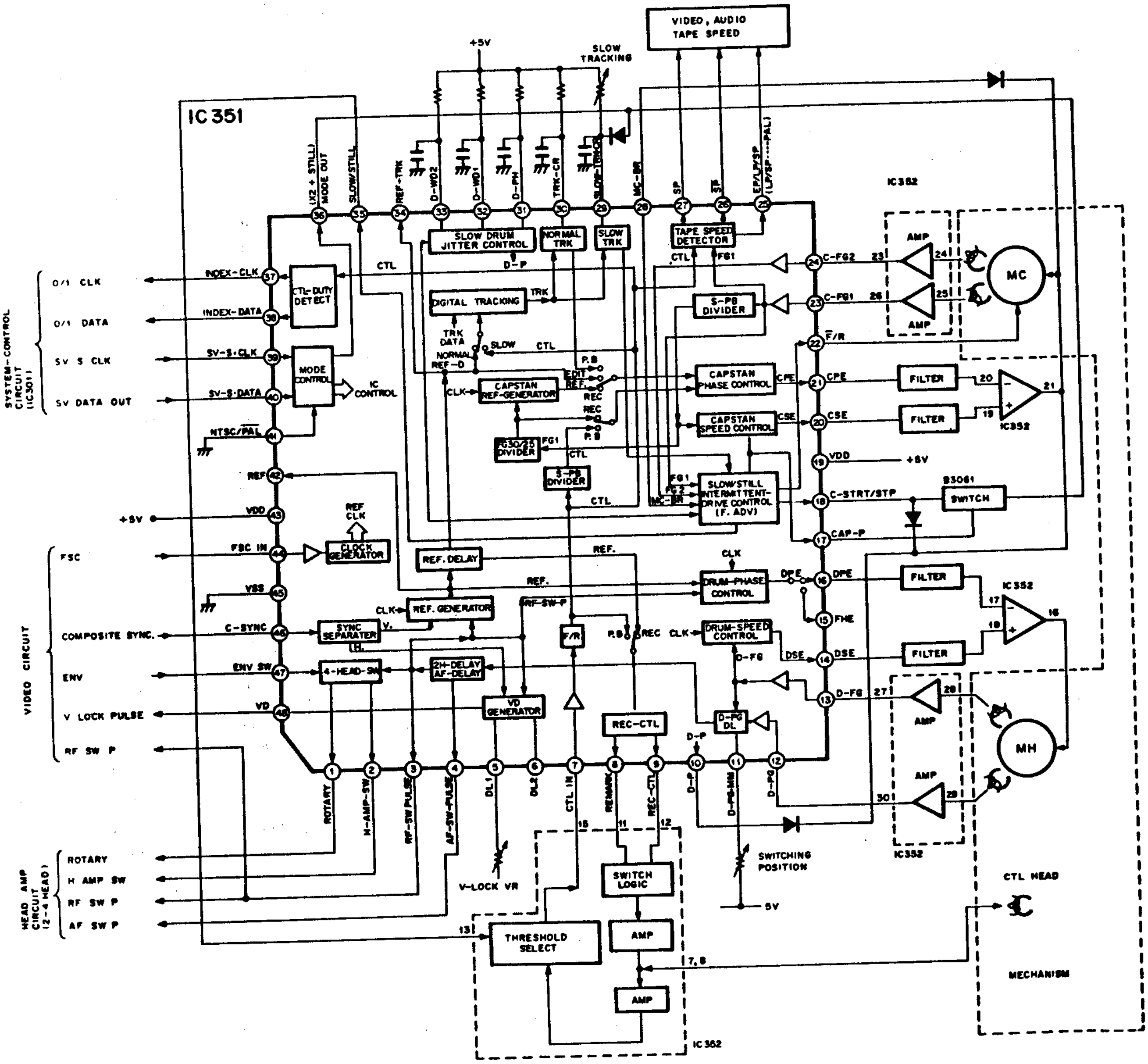

IC351
IC352
VIDEO, AUDIO TAPE SPEED
+5V
SLOW TRACKING
(X2 + STILL) MODE OUT
SLOW/STILL
REF-TRK
D-WD2
D-WD1
D-PH
TRK-CR
SLOW-TRACK
MC-BR
SP
SP
EP/LP/SP (LP/SP····PAL)
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
CTL
FG1
D-P
INDEX-CLK
INDEX-DATA
SV-S-CLK
SV-S-DATA
NTSC/PAL
CTL-DUTY DETECT
MODE CONTROL
IC CONTROL
DIGITAL TRACKING
TRK
TRK DATA
SLOW
NORMAL
REF-D
CAPSTAN REF-GENERATOR
CLK
P.B
EDIT
REF.
REC
FG30/25 DIVIDER
S-PB DIVIDER
CAPSTAN PHASE CONTROL
CAPSTAN SPEED CONTROL
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F. ADV)
FG1
FG2
MC-BR
SYSTEM-CONTROL CIRCUIT (IC3011)
0/1 CLK
0/1 DATA
SV S CLK
SV DATA OUT
REF
VDD
+5V
REF CLK
CLOCK GENERATOR
REF. DELAY
REF. GENERATOR
FSC IN
VSS
C-SYNC
ENV SW
VD
VIDEO CIRCUIT
FSC
COMPOSITE SYNC.
ENV
V LOCK PULSE
RF SW P
SYNC SEPARATER
V.
LH.
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
RF-SW-P
F/R
P.B
REC
DRUM-PHASE CONTROL
DRUM-SPEED CONTROL
D-FG
D-PG DL
REC-CTL
D-P
C-FG2
C-FG1
F/R
CPE
CSE
VDD
C-STRT/STP
CAP-P
DPE
FHE
DSE
D-FG
AMP
MC
FILTER
IC352
B3061
SWITCH
MH
ROTARY
H-AMP-SW
RF-SW PULSE
AF-SW-PULSE
DL1
DL2
CTL IN
REMAIN
REC-CTL
D-P
D-PG-MM
D-PG
HEAD AMP CIRCUIT (2-4 HEAD)
ROTARY
H AMP SW
RF SW P
AF SW P
V-LOCK VR
SWITCH LOGIC
AMP
THRESHOLD SELECT
SWITCHING POSITION
5V
CTL HEAD
MECHANISM

Fig. 4-2.

(4) Table of Digital Servo IC (IC351, LC7417/18) Pin Functions

Pin No.	Name	Input/Output Signal	I/O	Input/Output Function
1	ROTARY	ROTARY	O	Outputs the head switching control signal for 4-head and 3-head models.
2	HA-SW	H-AMP-SW	O	
3	RF-SW	RF-SW-PULSE	O	Video head switching pulse output.
4	AF-SW	AF-SW-PULSE	O	Audio head (FM) switching pulse output.
5	DL1	DL1	I	Dummy V$_D$ insertion position control CR.
6	DL2	DL2	I	Dummy V$_D$ insertion position control terminal.
7	CTL	CTL-IN	I	Control signal input.
8	REMARK	REMAK	O	Outputs the control signal re-recording control signal. Three-value output (H, M, L).
9	REC-CTL	REC-CTL	O	Recording control signal output. Three-value output (H, OPEN, L).
10	DRUM-P	D-P	O	Outputs the drum compensation pulse in the slow mode.
11	DPG-MM	D-PG. MM	I	CR for drum PG signal delay.
12	DPG	D-PG	I	Drum PG signal input.
13	DFG	D-FG	I	Drum FG signal input.
14	DSE	DSE	O	Outputs the speed error for drum system speed control. An output making the drum motor stop is delivered when DRUM-ON is "0". The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
15	FHE	FHE	O	Outputs the horizontal sync signal of the composite sync signal after F-V conversion (using the drum phase control system). The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
16	DPE	DPE		Error output for drum system phase control. The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
17	CAP-P	C-P	O	Outputs the capstan compensation pulse in the slow mode.
18	C-START/STP	C-START/STP	O	Outputs the capstan motor start and brake pulses in the slow mode.
19	V$_{DD}$			+ 5V ± 10%
20	CSE	CSE	O	Capstan system speed error output. An output making the capstan motor stop is delivered when CAP-ON is "0". The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
21	CPE	CPE	O	Capstan system phase reciprocal error output. The lower three bits of the output data forms R-2R ladder network and the 4th bits for DAC (D/A Converter) and upper 5th to 8th bits for PWM (Pulse Width Modulation).
22	F/R-OUT	$\overline{\text{F}}$/R	O	Capstan motor forward/reverse control output. "1" sets the reverse mode, and "0" the forward mode.
23	CFG1	C-FG1	I	Capstan FG signal input.
24	CFG2	C-FG2	I	2nd capstan FG signal input. Used for stop detection in the intermittent slow mode.
25	EP/LP/SP	EP/LP/SP	O	Recording mode output. Three-value output ("H" is for EP mode, "M" for LP mode and "L" for SP mode).
26	$\overline{\text{SP-OUT}}$	$\overline{\text{SP}}$	O	Recording mode output. "L" is for SP mode.
27	SP-OUT	SP	O	Recording mode output. "H" is for SP mode.
28	CAP-BRK	MC-BR	I	Control input for capstan F/R output.
29	SLOW-CR	SLOW-TRK-CR	I	CR for slow tracking adjustment.
30	TRK-CR	TRK-CR	I	CR for tracking adjustment.
31	D-PH	D-PH	I	CR for drum compensation timing adjustment in the slow mode.
32	D-WD1	D-WD1	I	
33	D-WD2	D-WD2	I	
34	REF-TRK	REF-TRK	O	Outputs the tracking delay input signal.
35	SLW/STL	SLOW/STILL	O	Internal mode signal output. "H" in the slow mode.
36	MODE-OUT	MODE (× 2+STILL)	O	Mode decoding signal output. At the × 2 SPEED mode and starting time of SLOW/STILL mode, output "H" level.
37	INDX-CK	INDEX-CLK	O	Outputs the timing for the control signal duty detector.
38	INDX-DT	INDEX-DATA	O	Outputs the control signal duty detection results.
39	SCLK	SV-S • CLK	I	Serial transmission clock pulse input.
40	SDATA	SV-S • DATA	I	Serial data input terminal.
41	NTSC/PAL	NTSC/$\overline{\text{PAL}}$	I	NTSC/PAL switching input. "H" is for NTSC, "L" for PAL.
42	REF-OUT	REF	O	Outputs the internal reference signal.
43	V$_{DD}$			+ 5V supply terminal
44	F$_{SC}$	FSC IN	I	Input for the IC internal system clock pulse. A level of at least 0.3 Vp-p is required. The color subcarrier signal is input by capacitive coupling.
45	V$_{SS}$			Ground
46	C-SYNC	C-SYNC	I	Composite sync signal input.
47	ENV	ENV SW	I	Head selection signal (PB envelope detection signal) input for 4-head special playback.
48	VD OUT	VD	O	Dummy V$_D$ signal output. Three-value output (H, M, L).

Table 4-2.

SANYO

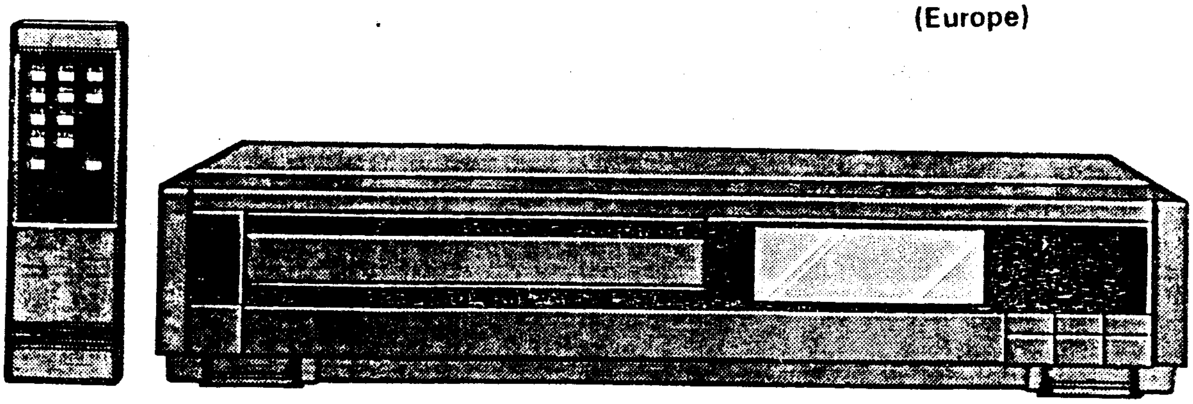
Parts List & Circuit Diagrams

Colour Video Cassette Recorder

VHR-4100G
(West Germany)

VHR-4100EX
(Europe)

VHR-4100EV
(Europe)



VHS PAL HQ

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Mechanism Parts 2 3
Mechanism Parts 3 5

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COMPL, VP-1 11
COMPL, AD-1 12
COMPL, SY-4 13
COMPL, PW-1 13
COMPL, PW-2 13
COMPL, TM-1 13
COMPL, TM-3 14
COMPL, TB-1 15
Remote Control Unit 16
Circuit Diagram

Please see other materials with Reference No. given in table below.

Materials	Model No.	Reference No.
Service Manual	VHR-4100 Series	WM-22341
Mechanism Manual	VHR-4100 Series	WM-22534
Training Manual	VHR-4100 Series	WM-22342

PRODUCT SAFETY NOTICE

The components designated by a symbol (⚠) in this schematic diagram designates components whose value are of special significance to product safety. Should any component designated by a symbol need to be replaced, use only the part designated in the Parts List. Do not deviate from the resistance, wattage and voltage ratings shown.

NOTE: Parts order must contain Model Number, Part Number and Description.

VHR-4100G, EX, EV
143-112-00, -01, -56

REFERENCE No. WM-22340

ACCESSORIES

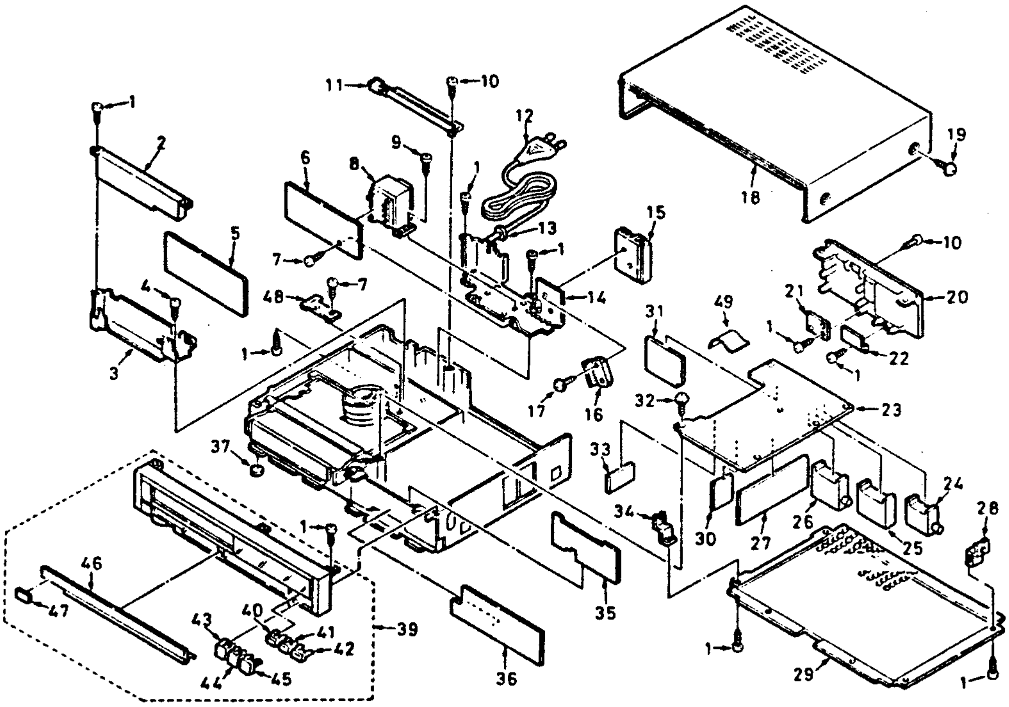
LOCATION	PARTS NO.	DESCRIPTION
	613 079 2907	INSTRUCTION MANUAL(VHR-4100G ONLY)
OR	613 022 4620	INSTRUCTION MANUAL(WITHOUT VHR-4100G)
	613 011 7359	CORD
	613 082 1959	PROTECTOR SHEET
	613 077 4385	REMOCON

PACKING MATERIALS

LOCATION	PARTS NO.	DESCRIPTION
	613 079 2679	INNER CORR CASE(VHR-4100G)
OR	613 022 4576	INNER CORR CASE(VHR-4100EX)
OR	613 079 2730	INNER CORR CASE(VHR-4100EV)
	613 022 4606	CUSHION INNER.LEFT
	613 022 4613	CUSHION INNER.RIGHT
	613 061 7279	IND POLYE COVER

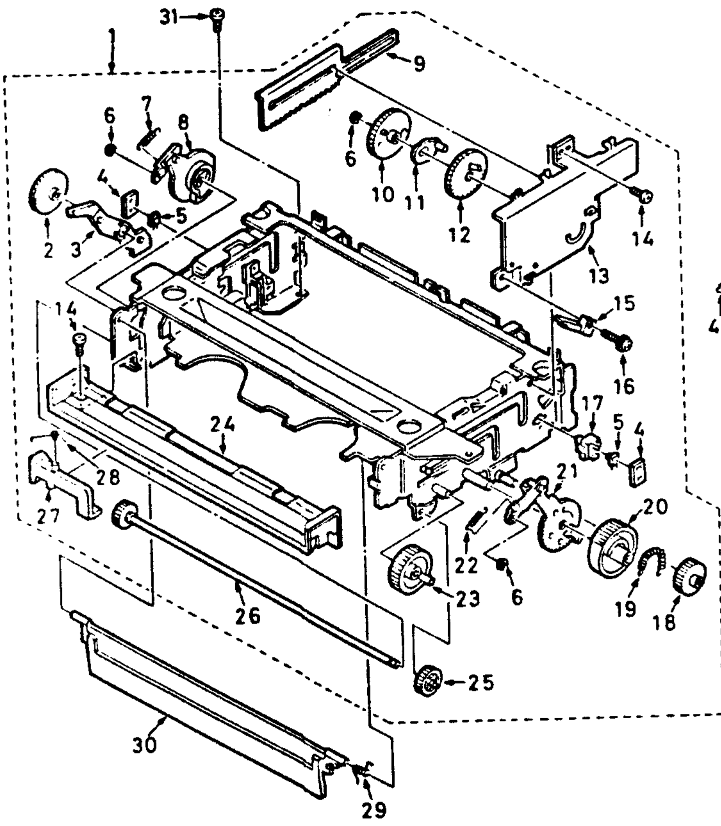
CABINET & CHASSIS PARTS

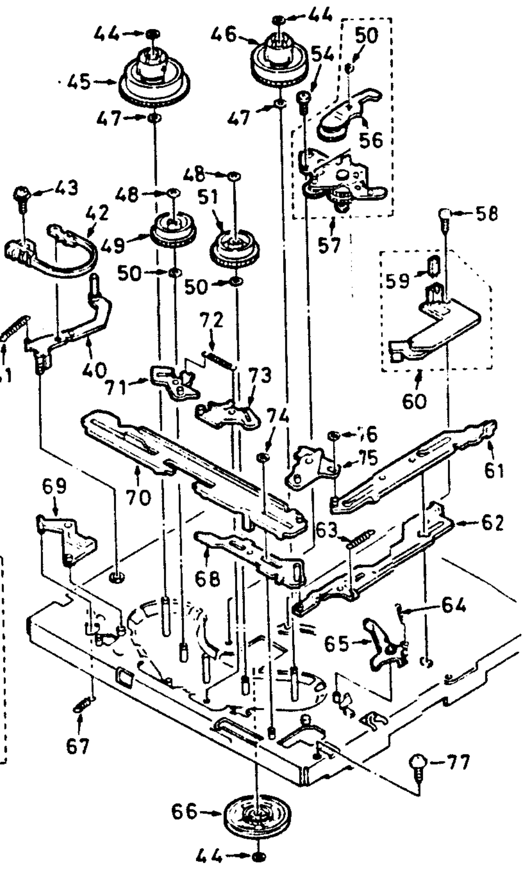
LOCATION	PARTS NO.	DESCRIPTION
1	411 021 4005	SCR S-TPG BIN 3X12
2	613 077 1735	COMPL.VP-1
3	613 077 3128	BRACKET.PRIAMP
4	411 001 8504	SCR BIN 3X4
5	613 079 0859	SHIELD
6	613 080 3672	COMPL.PW-1(WITHOUT VHR-4100G), WITHOUT LO.NO.14&15
OR	613 077 1803	COMPL.PW-1(VHR-4100G ONLY).WITHOUT LO.NO.14&15
7	411 021 6405	SCR S-TPG BIN 3X8
8 ⚠	613 077 4286	POWER TRANS.T5001
9	411 021 9604	SCR S-TPG BIN 4X8
10	411 021 4104	SCR S-TPG BIN 3X12
11	613 077 3487	BLIND
12 ⚠	613 033 4954	PLUG ASSY
13	613 053 6686	FIXER
OR	613 053 8017	FIXER
14	613 077 3142	BRACKET
15	613 079 3973	HEAT SINK
16	613 078 6579	COMPL.PW-2
17	411 021 4500	SCR S-TPG BIN 3X16
18	613 022 0554	COVER.TOP
19	412 024 7604	SPECIAL SCREW
20	613 077 2619	TERMINAL
21	613 080 3610	COMPL.TB-1
22	613 077 3159	BRACKET
23	613 079 3447	COMPL.CP-A(WITHOUT VHR-4100G)
OR	613 079 3379	COMPL.CP-A(VHR-4100G ONLY)
24	613 080 5836	MODULATOR.RF
OR	613 080 5843	MODULATOR.RF
25	613 031 8398	ASSY.TN-1
26	613 000 1504	ASSY.TUNER
27	613 077 1810	COMPL.VD-1
28	613 048 6912	BRACKET
29	613 022 0578	COVER.BOTTOM
30	613 078 6197	COMPL.VD-2
31	613 079 7421	COMPL.AD-1(VHR-4100G ONLY)
OR	613 079 7438	COMPL.AD-1(WITHOUT VHR-4100G)
32	411 021 4203	SCR S-TPG BIN 3X12
33	613 080 9124	COMPL.SY-4
34	613 022 0738	BRACKET.CABINET
35	613 080 9575	COMPL.TM-3(VHR-4100EX ONLY)
OR	613 077 1599	COMPL.TM-3(WITHOUT VHR-4100EX)
36	613 080 9568	COMPL.TM-1
37	613 047 1772	STAND
39	613 077 2077	ASSY.CABINET.FRONT(VHR-4100G)
OR	613 021 9541	ASSY.CABINET.FRONT(VHR-4100EX)
OR	613 078 7507	ASSY.CABINET.FRONT(VHR-4100EV)
40	613 022 0622	HINGE BUTTON.EJECT
41	613 022 0639	HINGE BUTTON.REW
42	613 022 0646	HINGE BUTTON.FF
43	613 022 0653	HINGE BUTTON.REC
44	613 022 0660	HINGE BUTTON.PLAY
45	613 022 0677	HINGE BUTTON.STOP
46	613 077 2534	DOOR(VHR-4100G)
OR	613 022 0592	DOOR(VHR-4100EX)
OR	613 078 9747	DOOR(VHR-4100EV)
47	613 042 0183	BADGE
48	613 081 2315	BRACKET.SP GUIDE
49	613 077 4422	FREXIBLE FRAT CABLE.MC-2~CP-1



MACHANISM PARTS 1

LOCATION	PARTS NO.	DESCRIPTION
1	613 022 0523	COMPL.CASSETTE MECHA
2	613 022 2572	GEAR.IDLER L
3	613 022 2275	LEVER.DOOR OPENER
4	613 022 0585	LID
5	407 098 3201	PHOTO COUPLE PN150SAN
6	411 015 9801	RING E 2.3
7	613 022 1643	SPRING.LINK L
8	613 022 0073	ASSY.GEAR.LEVER L
9	613 022 2695	RACK
10	613 022 2633	GEAR.LOCK
11	613 021 9916	ASSY.LEVER.PINION
12	613 022 2626	GEAR.PINION
13	613 021 9657	ASSY.BRACKET.GEAR
14	411 027 1305	SCR S-TPG BIN 2.6X4
15	613 006 4479	SPECIAL SWITCH
16	411 106 9208	SCR PAN+SW+W 2X9
17	613 022 0936	HOLDER.TRANSISTOR
18	613 022 2619	GEAR.IDLER
19	613 022 1667	SPRING.GEAR MAIN
20	613 022 2596	GEAR.MAIN
21	613 022 0097	ASSY.GEAR.LEVER R
22	613 022 1674	SPRING.LINK R
23	613 022 2602	GEAR.IDLER R
24	613 022 4064	BOARD.UNDER
25	613 022 2558	GEAR.COUPLE R
26	613 022 0226	ASSY.ROD
27	613 022 2237	LEVER.SAFETY SW
28	613 022 1827	SPRING.SAFETY SW
29	613 022 1803	SPRING.DOOR
30	613 022 4101	CASSETTE DOOR
31	411 001 8702	SCR BIN 3X6
40	613 021 9831	ASSY.LEVER.TENSION
41	613 022 1537	SPRING.LEVER TENSION
42	613 021 9701	ASSY.HOLDER.BAND
43	411 036 2805	SCR PAN+SW+W 2.6X6
44	411 109 1605	WASHER Y 2.6X6X0.25
45	613 022 0127	ASSY.REEL.SUPPLY
46	613 022 0110	ASSY.REEL.TAKE UP
47	412 021 5306	SPECIAL WASHER 3.1X6X0.3T
OR	412 015 8900	SPECIAL WASHER 3.1X6X0.4T
OR	412 015 8504	SPECIAL WASHER 3.1X6X0.5T
48	411 109 1506	WASHER Y 2.1X6X0.25
49	613 022 2473	GEAR.REEL SUPPLY
50	412 026 7305	SPECIAL WASHER 2.6X6X0.25
51	613 022 2480	GEAR.REEL TAKE UP
54	411 031 0905	SCR BIN 2.6X4
56	613 022 0134	ASSY.IDLER
57	613 022 0141	COMPL.IDLER.CLUTCH
58	411 076 5804	SCR TPG BIN 2.6X8
59	407 016 7205	LED LN59
60	613 078 6302	COMPL.MC-4
61	613 021 9985	ASSY.SLIDE.ACT PLATE
62	613 021 9992	ASSY.SLIDE.C BRAKE
63	613 022 1612	SPRING.RETURN SLIDE
64	613 022 1506	SPRING.SUB T
65	613 022 0196	ASSY.BRAKE.SUB T
66	613 077 3647	PULLEY.REEL
67	613 022 1490	SPRING.SUB SUPPLY
68	613 022 2374	SLIDE.ACT BRAKE
69	613 022 2886	BRAKE.SUB SUPPLY
70	613 022 0004	ASSY.SLIDE.M PLATE
71	613 080 9216	ASSY.BRAKE.SUPPLY
72	613 022 1544	SPRING.MAIN BRAKE
73	613 080 9209	ASSY.BRAKE.TAKE UP
74	411 109 3005	WASHER Y 2.6X5X0.5
75	613 022 2015	LEVER.CONT PLATE
76	411 109 1407	WASHER Y 2.1X5X0.25
77	411 021 7907	SCR S-TPG BIN 4X12



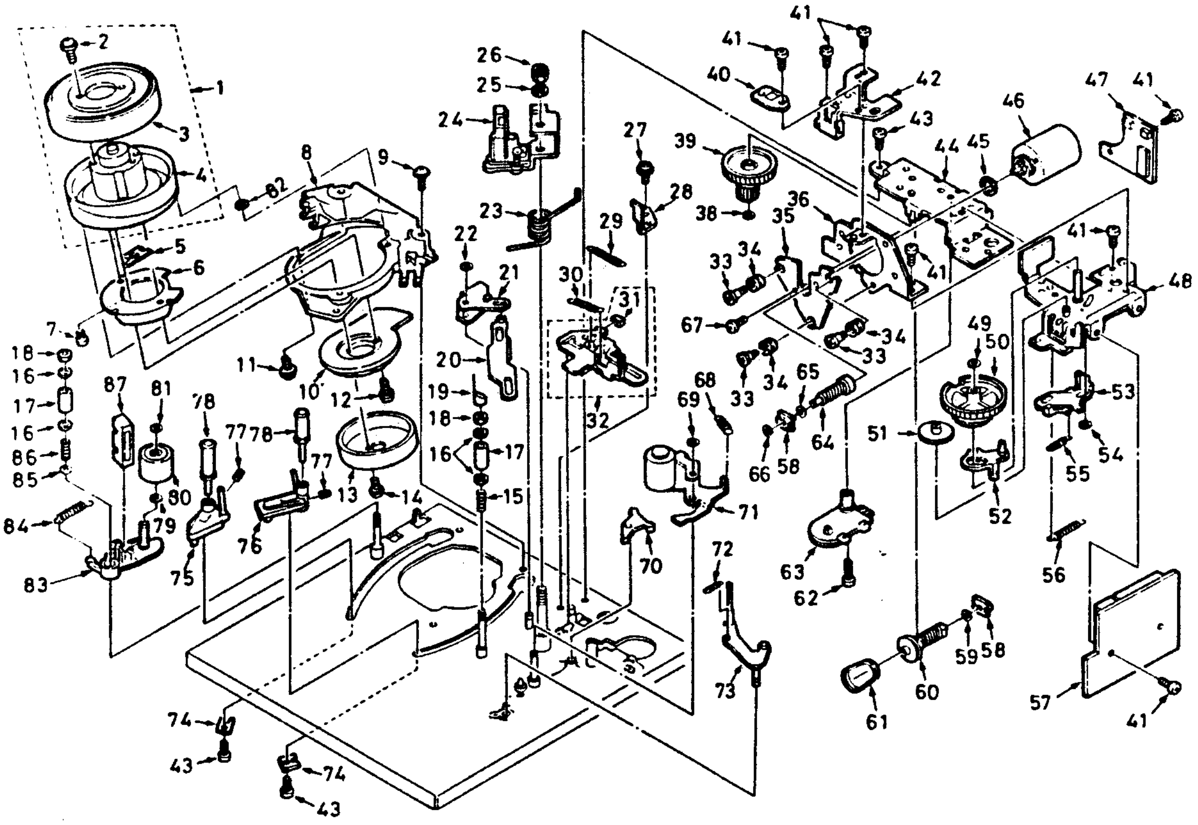


MACHANISM PARTS 2

LOCATION	PARTS NO.	DESCRIPTION
1	613 022 0257	COMPL.CYLINDER.2N2P
OR	613 080 1647	COMPL.CYLINDER.2N2P
2	411 038 1608	SCR PAN+W 3X8
3	613 022 0264	ASSY.CYLINDER.UPR 2N2P
OR	613 080 1654	ASSY.CYLINDER.UPR 2N2P
4	613 022 0271	ASSY.CYLINDER.LWR2
OR	613 080 1661	ASSY.CYLINDER.LWR 2
5	613 081 4036	SPACER.MOTOR
6	613 079 0712	BRACKET.MOTOR CYL
7	412 026 8302	SPECIAL SCREW M2.3X3
8	613 022 1001	BASE.CYLINDER
9	411 047 7509	SCR PAN+FLG 3X6
10	613 022 4026	STATOR.MOTOR CYL
11	411 047 5000	SCR PAN+FLG 2.6X8
12	411 044 9209	SCR PAN+SW 2.3X8
13	613 022 4019	ROTOR.MOTOR CYL
14	411 044 9001	SCR PAN+SW 2.3X6
15	613 022 1766	SPRING.ADJUST GUIDE
16	613 053 3227	SPECIAL WASHER
17	613 058 3307	TAPE GUIDE
18	412 026 2607	SPECIAL NUT
19	613 081 7501	ASSY.CAP
20	613 021 9961	ASSY.SLIDE.ACT PINCH
21	613 021 9800	ASSY.LEVER.CAM PINCH
22	411 109 2008	WASHER Y 3.1X8X0.5
23	613 022 1797	SPRING.ACE HEAD
24	613 021 9640	COMPL.BRACKET.HEAD
25	613 051 4615	SPACER
26	412 015 8207	SPECIAL NUT
27	411 120 0007	SCR PAN+SW+W 2.6X5
28	613 022 0752	BRACKET.STOPPER
29	613 022 1575	SPRING.LINK LOCK
30	613 022 1582	SPRING.SLIDE BRAKE
31	613 022 2725	DAMPER
32	613 022 0059	ASSY.SLIDE.CAM
33	412 021 1407	SPECIAL SCREW
34	613 079 1030	DAMPER.MOTOR
35	613 079 0989	PLATE.MOTOR
36	613 079 0736	BRACKET.STAND
38	411 109 1902	WASHER Y 3.1X6X0.5
39	613 077 3579	GEAR.HELICAL
40	613 021 9534	ASSY.DEW SENSOR
41	411 040 2303	SCR PAN 2.6X5
42	613 077 3180	BRACKET.HOLDER
43	411 031 1209	SCR BIN 2.6X5
44	613 079 6868	ASSY.BRACKET.MOTOR
44-A	613 078 7682	ASSY.BRACKET.MOTOR
45	613 077 3616	DAMPER.WORM
46	613 021 9527	ASSY.LOADING MOTOR
47	613 078 6623	COMPL.MC-3
47-A	613 078 6517	COMPL.MC-3
48	613 078 7705	ASSY.BRACKET.FRONT
49	613 027 0504	WASHER 4.1X6.5X0.5
50	613 077 3586	GEAR.HELICAL FRONT
51	613 022 2534	GEAR.FRONT LOAD
52	613 021 9824	ASSY.LEVER.FRONT
53	613 022 0011	ASSY.SLIDE.FRONT
54	411 109 3005	WASHER Y 2.6X5X0.5
55	613 022 1636	SPRING.LEVER ACT
56	613 022 1629	SPRING.LEVER LOAD
57	613 078 6494	COMPL.MC-2
57-1	403 001 3108	CERAMIC 0.1U Z 16V.INCLUDE MC-2
57-2	613 009 8309	SOCKET 26P.INCLUDE MC-2
58	613 077 3227	HOLDER.WORM
59	613 027 0627	WASHER 2.1X6X0.5
60	613 078 8344	ASSY.WORM.LOAD
61	613 022 2985	BELT.LOADING
62	411 002 5700	SCR PAN 2.6X12
63	613 077 4361	ROTARY SWITCH
64	613 078 8320	ASSY.WORM.FRONT
65	613 027 0375	WASHER 2.1X4.0X0.13
66	613 053 2381	SPECIAL WASHER
67	411 040 0507	SCR PAN 2.6X3
68	613 022 1483	SPRING.PINCH ROLLER
69	411 109 2107	WASHER Y 3.6X6X0.5
70	613 078 8160	COMPL.LEVER.ACT BRAKE
71	613 022 0158	COMPL.PINCH ROLLER
72	613 022 1568	SPRING.REVIEW LEVER
73	613 021 9886	ASSY.LEVER.REV GUIDE
74	613 022 1919	PLATE.GUIDE
75	613 021 9725	ASSY.BASE.ROLLER S
76	613 021 9732	ASSY.BASE.ROLLER T
77	411 063 0904	SCR SET HEX-SCT 2X3
78	613 022 0233	ASSY.GUIDE.ROLLER
79	412 026 7800	SPECIAL WASHER 0.25T
80	613 080 6703	IMPEDANCE ROLLER
81	411 109 2602	WASHER Y 1.5X4X0.25
82	412 029 8606	WASHER 3.2X5.5X0.2
83	613 021 9893	ASSY.LEVER.FE HEAD
84	613 022 1698	SPRING.ERASE HEAD
85	411 109 1704	WASHER Y 6.4X10X0.25
86	613 022 1773	SPRING.GUIDE SUPPLY
87	613 022 4224	FTE HEAD

* Front loading mechanism have STANDARD TYPE and A TYPE.

STANDARD TYPE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A TYPE

NOTE :

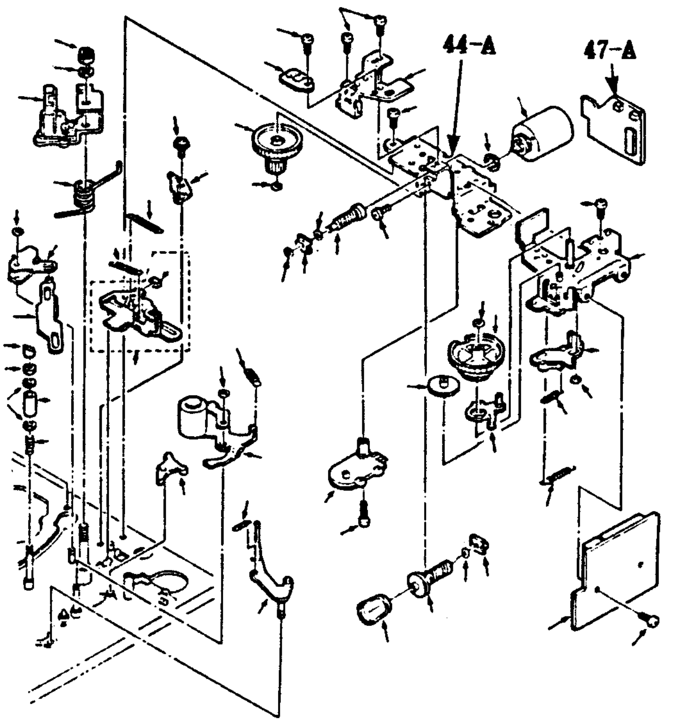
1. A type is not used Location No. 33, 34, 35, & 36.

2. A type is changed to Location No. 44-A & 47-A from Location No. 44 & 47.

3. Other parts of A type is used same parts to standard type.

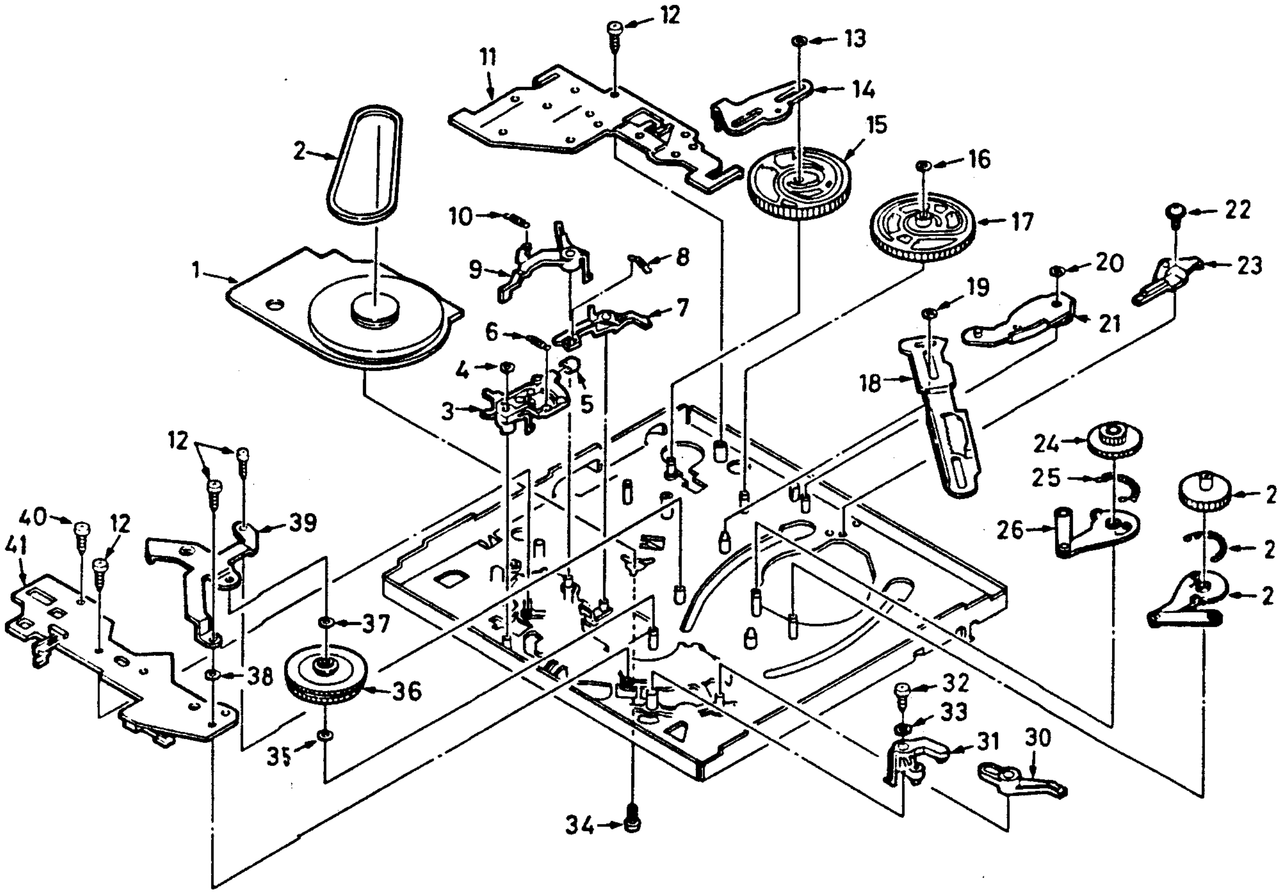
A TYPE mecanism is used :

	SERIAL NO. From	TO
VHR4100EX	75110001 ~	75110500
VHR-4100G	Not Used	
VHR-4100EV	Not Used	



MACHANISM PARTS 3

LOCATION	PARTS NO.	DESCRIPTION
1	613 022 4484	MOTOR.CAPSTAN
OR	613 080 8912	MOTOR.CAPSTAN
2	613 022 2978	BELT.REEL DRIVE
3	613 021 9848	ASSY.LEVER.CLUTCH
4	411 015 4301	RING CS 3
5	613 079 1023	DAMPER.LEVER CLUTCH
6	613 022 1520	SPRING.LEVER CLUTCH
7	613 022 2053	LEVER.CHANGE CLUTCH
8	613 022 1711	SPRING.CHANGE CLUTCH
9	613 081 7518	ASSY.BRAKE.CAPSTAN
10	613 022 1513	SPRING.CAPSTAN
11	613 022 0837	BRACKET.REINFORCE
12	411 021 3107	SCR S-TPG BIN 2.6X8
13	411 109 2008	WASHER Y 3.1X8X0.5
14	613 021 9978	ASSY.SLIDE.CAM PLATE
15	613 022 2701	CAM.MODE
16	411 109 1902	WASHER Y 3.1X6X0.5
17	613 022 2718	CAM.MAIN
18	613 022 2664	RACK.LOAD
19	411 109 1803	WASHER Y 2.6X6X0.5
20	411 109 2206	WASHER Y 3.6X8X0.5
21	613 021 9794	ASSY.LEVER.CAM LOAD
22	411 047 6809	SCR PAN+FLG 3X4
23	613 021 9763	ASSY.EARTH.CYL
24	613 022 2435	GEAR.LOAD TAKE UP
25	613 022 1551	SPRING.GEAR LOAD
26	613 021 9879	ASSY.LEVER.LOAD T
27	613 022 2428	GEAR.LOAD SUPPLY
28	613 022 1704	SPRING
29	613 021 9862	ASSY.LEVER.LOAD S
30	613 022 2039	LEVER.RETURN TENSION
31	613 021 9817	ASSY.LEVER.CONTROL
32	411 022 8903	SCR S-TPG PAN 2.3X12
33	411 087 6005	WASHER V 2.6X7.5X0.5
34	411 040 2303	SCR PAN 2.6X5
35	412 015 8603	SPECIAL WASHER
36	613 022 0066	ASSY.GEAR.FRICTION
37	411 109 1605	WASHER Y 2.6X6X0.25
38	411 102 9905	WASHER Y 3.2X8X1
39	613 079 8121	BRACKET.PULLEY
40	411 100 0300	SCR S-TPG BIN 2.6X5
41	613 077 9489	COMPL.MC-1
41-1	401 024 6403	CARBON 100 JA 1/6W R 3.INCLUDE MC-1
41-2	401 026 0607	CARBON 270 JA 1/6W R 1.INCLUDE MC-1
41-3	613 022 4538	SW.SPECIAL.FRONT END.INCLUDE MC-1
41-4	613 022 4545	SPECIAL SWITCH.E-P.INCLUDE MC-1
41-5	407 094 1300	PHOTO COUPLE SPI-315-04-C.INCLUDE MC-1
41-6	613 022 1155	SPACER.PHOTO SENSOR.INCLUDE MC-1



ELECTRICAL PARTS

NOTE;

*Materials of Capacitors and Resistors are abbreviated as follows;

Resisteors	
MT-FILE	Metal Film Resistor
MT-GLAZE	Metal Glaze Resistor
OXIDE-MT	Oxide Net a l Film Resistor
Capacitors	
MT-POLYEST	Metallized Pollyester Capacitor
MT-COMPO	Metallized Composite Capacitor

TA-SOLID	Tantalum Solid Cacacitor
AL-SOLID	Aliminium Solid Capacitor
NP-ELECT	Non-Polarized Electrolytic Capacitor
OS-SOLID	Aliminium Solid Capacitors with Organic Semiconductive
DL-ELECT	Double Layered Electrolytic Capacitor

*Tolerance of Capacitor(10pF over) and Resistor are noted with follw symboles.

F ············ ± 1 %	G ············ ±2%	J ············ ±5%	K ············ ±10%
M ············ ±20%	N ············ ±30%	Z ············ ±80% ······ −20%	

LOCATION	PARTS NO.	DESCRIPTION
COMPL.CP-A		
COMPL.NO.	613 079 3379	VHR-4100G
COMPL.NO.	613 079 3447	VHR-4100EX.EV

VIDEO CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
B1601	405 018 2501	TR 2SC3399-AC
OR	405 001 0408	TR RN1204-TPE4
B1602	405 018 2501	TR 2SC3399-AC
OR	405 001 0408	TR RN1204-TPE4
C1601	403 039 2609	ELECT 47U M 6.3V
C1602	403 039 2609	ELECT 47U M 6.3V
C1603	403 121 9509	CERAMIC 0.1U Z 50V
C1604	403 038 2006	ELECT 100U M 6.3V
C1605	403 001 1906	CERAMIC 0.01U M 16V
C1606	403 039 3507	ELECT 470U M 6.3V
C1607	403 042 3006	ELECT 100U M 16V
C1608	403 022 7703	CERAMIC 33P J 50V
C1609	403 024 1501	CERAMIC 39P J 50V
C1610	403 043 9601	ELECT 47U M 16V
C1611	403 001 1906	CERAMIC 0.01U M 16V
C1612	403 038 5403	ELECT 22U M 6.3V
C1616	403 001 1906	CERAMIC 0.01U M 16V
CN161	613 009 1635	SOCKET 21P
D1601	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1602	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1603	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1604	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1605	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1606	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC161	409 003 4501	IC BA7021
L1601	613 015 6730	HF CHOKE 100UH K
L1602	613 014 0975	HF CHOKE 100UH K
L1603	613 015 6730	HF CHOKE 100UH K
Q1601	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
Q1602	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC

LOCATION	PARTS NO.	DESCRIPTION
Q1602	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
Q1603	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1806	TR 2SA933S-T93-R
Q1604	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
Q1605	405 004 4007	TR 2SA608-E-SPA-AC
OR	405 004 4601	TR 2SA608-F-SPA-AC
OR	405 006 1707	TR 2SA933S-TP-Q
OR	405 006 1806	TR 2SA933S-T93-R
R1601	401 020 1907	CARBON 4.7K JA 1/4W
R1602	401 022 6702	CARBON 75 JA 1/4W
R1603	401 012 6903	CARBON 10K JA 1/4W
R1604	401 012 6903	CARBON 10K JA 1/4W
R1606	401 020 2805	CARBON 47K JA 1/4W
R1607	401 020 2805	CARBON 47K JA 1/4W
R1608	401 016 4707	CARBON 22K JA 1/4W
R1610	401 021 2903	CARBON 5.6K JA 1/4W
R1611	401 021 2903	CARBON 5.6K JA 1/4W
R1612	401 016 4707	CARBON 22K JA 1/4W
R1613	401 021 0602	CARBON 56 JA 1/4W
R1614	401 013 5202	CARBON 1.2K JA 1/4W
R1615	401 021 1807	CARBON 560 JA 1/4W
R1616	401 012 4404	CARBON 100 JA 1/4W
R1617	401 021 1807	CARBON 560 JA 1/4W
R1618	401 022 6702	CARBON 75 JA 1/4W
R1619	401 013 9408	CARBON 1.3K JA 1/4W
R1620	401 021 2903	CARBON 5.6K JA 1/4W
R1621	401 015 2605	CARBON 1.8K JA 1/4W
RT622	401 012 5609	CARBON 1K JA 1/4W
R1623	401 023 1607	CARBON 820 JA 1/4W
R1624	401 015 2605	CARBON 1.8K JA 1/4W
R1625	401 021 1807	CARBON 560 JA 1/4W
R1628	401 012 6903	CARBON 10K JA 1/4W

AUDIO CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
C2151	403 070 7809	CERAMIC 150P K 50V(VHR-4100G ONLY)
F2151	613 082 6046	FILTER(VHR-4100G ONLY)
F2152	613 082 6039	FILTER(VHR-4100G ONLY)
R2101	401 017 9701	CARBON 30K JA 1/4W
R2102	401 019 7705	CARBON 4.3K JA 1/4W
R2103	401 020 2805	CARBON 47K JA 1/4W
R2104	401 019 7705	CARBON 4.3K JA 1/4W
R2105	401 023 1607	CARBON 820 JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R2107	401 017 1705	CARBON 2.7K JA 1/4W
R2108	401 017 1705	CARBON 2.7K JA 1/4W
R2109	401 023 1607	CARBON 820 JA 1/4W
R2110	401 015 2605	CARBON 1.8K JA 1/4W

SYSTEM CONTROL CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
C3041	403 069 1207	CERAMIC 1000P K 50V
C3042	403 038 1603	ELECT 100U M 6.3V
C3043	403 001 3108	CERAMIC 0.1U Z 16V
C3044	403 001 3108	CERAMIC 0.1U Z 16V
C3051	403 071 6207	CERAMIC 220P K 50V
C3072	403 121 9509	CERAMIC 0.1U Z 50V
C3073	403 038 1603	ELECT 100U M 6.3V
C3074	403 022 7703	CERAMIC 33P J 50V
C3075	403 022 7703	CERAMIC 33P J 50V
C3076	403 121 9509	CERAMIC 0.1U Z 50V
C3078	403 038 8602	ELECT 33U M 6.3V
C3081	403 002 2506	CERAMIC 0.01U M 25V
C3082	403 121 9509	CERAMIC 0.1U Z 50V
C3111	403 069 1207	CERAMIC 1000P K 50V
CN301	613 009 4735	SOCKET 26P
D3001	407 078 2804	DIODE 1SS245-T-77
D3002	407 005 2303	DIODE DS135E
OR	407 005 1603	DIODE DS135D
D3003	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3051	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3081	407 063 9504	ZENER DIODE MTZJ8.2B-T-77
OR	407 070 8101	ZENER DIODE GZS8.2Y-BT
D3082	407 099 5303	ZENER DIODE MTZJ5.6B-T-77
OR	407 051 6904	ZENER DIODE GZS5.6Y-BT
IC301	410 047 2002	IC LC66508B-3732
IC302	409 114 4803	IC LB1641
IC303	409 057 3406	IC UPC393C
OR	409 018 3902	IC LA6393D
OR	409 003 3900	IC BA6993
IC306	409 032 3704	IC MN1280-R
OR	409 032 3803	IC MN1280-S
R3001	401 012 5708	CARBON 1K JA 1/4W
R3013	401 012 5609	CARBON 1K JA 1/4W
R3014	401 012 5609	CARBON 1K JA 1/4W
R3022	401 012 5609	CARBON 1K JA 1/4W
R3027	401 012 5609	CARBON 1K JA 1/4W
R3028	401 012 6903	CARBON 10K JA 1/4W
R3029	401 020 1907	CARBON 4.7K JA 1/4W
R3030	401 020 1907	CARBON 4.7K JA 1/4W
R3031	401 012 5609	CARBON 1K JA 1/4W
R3041	401 012 5609	CARBON 1K JA 1/4W
R3042	401 014 4006	CARBON 1.5K JA 1/4W
R3043	401 017 9701	CARBON 30K JA 1/4W
R3044	401 017 9701	CARBON 30K JA 1/4W
R3045	401 022 3008	CARBON 6.8K JA 1/4W
R3046	401 013 7206	CARBON 120K JA 1/4W
R3051	401 023 4509	CARBON 820K JA 1/4W
R3052	401 017 2702	CARBON 27K JA 1/4W
R3053	401 016 3700	CARBON 2.2K JA 1/4W
R3054	401 017 3709	CARBON 270K JA 1/4W
R3055	401 018 4804	CARBON 33K JA 1/4W
R3056	401 016 0006	CARBON 20K JA 1/4W
R3057	401 016 4707	CARBON 22K JA 1/4W
R3058	401 021 4006	CARBON 56K JA 1/4W
R3059	401 014 6000	CARBON 150K JA 1/4W
R3060	401 012 6903	CARBON 10K JA 1/4W
R3074	401 020 1907	CARBON 4.7K JA 1/4W
R3075	401 022 7105	CARBON 750 JA 1/4W
R3083	401 022 7105	CARBON 750 JA 1/4W
R3084 ⚠	402 036 4401	FUSIBLE RES 3.3 JA 1/2W
R3091	401 012 8006	CARBON 100K JA 1/4W
R3092	401 012 8006	CARBON 100K JA 1/4W
R3093	401 012 8105	CARBON 100K JA 1/4W
R3094	401 012 8105	CARBON 100K JA 1/4W
R3095	401 012 8006	CARBON 100K JA 1/4W
R3096	401 023 4509	CARBON 820K JA 1/4W
R3097	401 012 5609	CARBON 1K JA 1/4W
R3098	401 012 5609	CARBON 1K JA 1/4W
R3099	401 012 5609	CARBON 1K JA 1/4W
R3100	401 012 5609	CARBON 1K JA 1/4W
R3101	401 012 5609	CARBON 1K JA 1/4W
R3102	401 012 5609	CARBON 1K JA 1/4W
R3111	401 012 5609	CARBON 1K JA 1/4W
R3113	401 012 5609	CARBON 1K JA 1/4W
R3114	401 012 5609	CARBON 1K JA 1/4W
R3115	401 012 5609	CARBON 1K JA 1/4W
R3116	401 012 5708	CARBON 1K JA 1/4W
R3124	401 016 4707	CARBON 22K JA 1/4W
R3125	401 017 9701	CARBON 30K JA 1/4W
R3133	401 015 3800	CARBON 18K JA 1/4W
R3134	401 012 5708	CARBON 1K JA 1/4W
R3151	401 020 2805	CARBON 47K JA 1/4W
R3171	401 012 8006	CARBON 100K JA 1/4W
RB301	613 078 5770	RESISTOR PACK 4.7KX3
OR	613 079 3997	RESISTOR PACK
OR	613 079 5922	R-NETWORK.4.7KX3
RB302	613 078 5763	RESISTOR PACK 3.9KX3
OR	613 079 3980	RESISTOR PACK
OR	613 079 5915	R-NETWORK.3.9KX3
RB303	613 078 5763	RESISTOR PACK 3.9KX3
OR	613 079 3980	RESISTOR PACK
OR	613 079 5915	R-NETWORK.3.9KX3
XF301	613 016 6869	CERAMIC RESONATOR 4MHZ
OR	613 016 7026	CERAMIC RESONATOR 4MHZ

SERVO CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
B3901	405 018 2600	TR 2SC3400-AC
OR	405 000 4407	TR DTC124ES-DCTP
B3902	405 003 7900	TR 2SA1348-AC
OR	405 000 0508	TR DTA114ES-DCTP
C3501	403 059 6502	POLYESTER 0.022U K 50V
C3502	403 002 8201	CERAMIC 0.015U J 25V
C3503	403 004 3006	CERAMIC 6800P J 25V
C3505	403 002 8201	CERAMIC 0.015U J 25V
C3506	403 038 5403	ELECT 22U M 6.3V
C3507	403 038 5403	ELECT 22U M 6.3V
C3508	403 003 1102	CERAMIC 2200P J 25V
C3509	403 002 7204	CERAMIC 1500P K 25V
C3510	403 004 3006	CERAMIC 6800P J 25V
C3511	403 038 5403	ELECT 22U M 6.3V
C3512	403 038 5403	ELECT 22U M 6.3V
C3513	403 057 7501	POLYESTER 0.012U K 50V
C3514	403 071 6207	CERAMIC 220P K 50V
C3515	403 041 9405	ELECT 10U M 16V
C3516	403 050 7102	ELECT 3.3U M 50V
C3517	403 003 1102	CERAMIC 2200P J 25V
C3518	403 085 6002	NP-ELECT 33U M 16V
C3519	403 069 0309	CERAMIC 1000P J 50V
C3520	403 098 5405	POLYESTER 0.039U K 50V
C3521	403 062 0405	POLYESTER 0.047U K 50V
C3522	403 057 2902	POLYESTER 0.1U K 50V

LOCATION	PARTS NO.	DESCRIPTION
C3523	403 057 9000	POLYESTER 0.12U J 50V
C3526	403 086 2607	NP-ELECT 1U M 50V
C3527	403 002 1509	CERAMIC 0.01U J 25V
C3528	403 048 2508	ELECT 0.22U M 50V
C3529	403 069 0309	CERAMIC 1000P J 50V
C3530	403 049 0800	ELECT 1U M 50V
C3531	403 001 1609	CERAMIC 0.01U K 16V
C3533	403 039 2609	ELECT 47U M 6.3V
C3534	403 121 9509	CERAMIC 0.1U Z 50V
C3537	403 039 2609	ELECT 47U M 6.3V
C3538	403 039 2609	ELECT 47U M 6.3V
C3539	403 004 4409	CERAMIC 0.068U J 25V
C3540	403 058 9504	POLYESTER 0.018U J 50V
C3541	403 069 1207	CERAMIC 1000P K 50V
D3501	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3502	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3503	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3504	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3901	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D3902	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC351	409 154 2708	IC LC7417-8074
IC352	409 155 2806	IC LA7122
Q3501	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
Q3503	405 024 9907	TR 2SD734-F-AA
OR	405 024 9709	TR 2SD734-E-AA
Q3901	405 019 2708	TR 2SC536-F-NP-AA
OR	405 011 8500	TR 2SC1740S-DCTP-R
R3501	401 018 4804	CARBON 33K JA 1/4W
R3502	401 012 8006	CARBON 100K JA 1/4W
R3503	401 012 8006	CARBON 100K JA 1/4W
R3506	401 018 5702	CARBON 330K JA 1/4W
R3507	401 014 5102	CARBON 15K JA 1/4W
R3508	401 014 6000	CARBON 150K JA 1/4W
R3509	401 020 2805	CARBON 47K JA 1/4W
R3510	401 020 2805	CARBON 47K JA 1/4W
R3511	401 012 6903	CARBON 10K JA 1/4W
R3512	401 018 5702	CARBON 330K JA 1/4W
R3513	401 017 2702	CARBON 27K JA 1/4W
R3514	401 014 6000	CARBON 150K JA 1/4W
R3516	401 017 3709	CARBON 270K JA 1/4W
R3518	401 016 4707	CARBON 22K JA 1/4W
R3519	401 016 4707	CARBON 22K JA 1/4W
R3520	401 020 9200	CARBON 510K JA 1/4W
R3522	401 016 5704	CARBON 220K JA 1/4W
R3525	401 018 7508	CARBON 360 JA 1/4W
R3526	401 020 7800	CARBON 510 JA 1/4W
R3527	401 020 7800	CARBON 510 JA 1/4W
R3528	401 014 6000	CARBON 150K JA 1/4W
R3529	401 012 6903	CARBON 10K JA 1/4W
R3531	401 012 5609	CARBON 1K JA 1/4W
R3532	401 016 3700	CARBON 2.2K JA 1/4W
R3533	401 016 3700	CARBON 2.2K JA 1/4W
R3538	401 012 6903	CARBON 10K JA 1/4W
R3539	401 014 4006	CARBON 1.5K JA 1/4W
R3540	401 012 6903	CARBON 10K JA 1/4W
R3541	401 012 5609	CARBON 1K JA 1/4W
R3542	401 012 6903	CARBON 10K JA 1/4W
R3544	401 012 8006	CARBON 100K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
R3545	401 014 6000	CARBON 150K JA 1/4W
R3546	401 012 5609	CARBON 1K JA 1/4W
R3547	401 012 5609	CARBON 1K JA 1/4W
R3548	401 012 5609	CARBON 1K JA 1/4W
R3549	401 014 6000	CARBON 150K JA 1/4W
R3561	401 012 8105	CARBON 100K JA 1/4W
R3562	401 016 4707	CARBON 22K JA 1/4W
R3563	401 016 0006	CARBON 20K JA 1/4W
R3901	401 017 1705	CARBON 2.7K JA 1/4W
R3902	401 016 4707	CARBON 22K JA 1/4W
R3903	401 018 3708	CARBON 3.3K JA 1/4W
R3904	401 016 3700	CARBON 2.2K JA 1/4W
VR351	613 001 9110	SEMI VR 220KB
OR	613 001 9462	SEMI VR 200KB

POWER SUPPLY CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
B5401	405 018 2808	TR 2SC3402-AC
OR	405 000 3103	TR DTC114ES-DCTP
C5401	403 001 1609	CERAMIC 0.01U K 16V
D5401	407 078 2705	DIODE 1SS244-T-77
D5402	407 053 6209	ZENER DIODE MTZ5.1A-T-77
D5403	407 078 2705	DIODE 1SS244-T-77
F5401 ⚠	423 011 8405	FUSE 0.315A 250V
Q5401	405 007 3106	TR 2SB544-F-MP-AE
Q5402	405 016 9601	TR 2SC3070-AE
R5401	401 021 8905	CARBON 6.2K JA 1/4W
R5402	401 016 3700	CARBON 2.2K JA 1/4W
R5403	401 019 7200	CARBON 430 JA 1/4W

TUNER CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
C6001	403 067 5603	MT-COMPO 0.1U J 50V
OR	403 065 8002	MT-POLYEST 0.1U J 63V
C6002	403 046 9905	ELECT 4.7U M 25V
C6003	403 049 0008	ELECT 1U M 50V
C6004	403 067 5603	MT-COMPO 0.1U J 50V
OR	403 065 8002	MT-POLYEST 0.1U J 63V
C6005	403 046 9905	ELECT 4.7U M 25V
L6002	613 014 0852	HF CHOKE 10UH K
L6003	613 014 0852	HF CHOKE 10UH K
L6004	613 014 0852	HF CHOKE 10UH K
L6006	613 014 0852	HF CHOKE 10UH K
R6001	401 019 0904	CARBON 390 JA 1/4W
R6002	401 019 0904	CARBON 390 JA 1/4W
R6004	401 019 3905	CARBON 390K JA 1/4W
R6005	401 020 3802	CARBON 470K JA 1/4W

TIMER CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
C7001	403 001 1906	CERAMIC 0.01U M 16V
C7002	403 001 1906	CERAMIC 0.01U M 16V
C7003	403 121 9509	CERAMIC 0.1U Z 50V
C7004	403 050 2800	ELECT 22U M 50V
C7005	403 071 2001	CERAMIC 180P K 50V
C7006	403 067 5603	MT-COMPO 0.1U J 50V
OR	403 065 8002	MT-POLYEST 0.1U J 63V
C7007	403 067 7300	MT-COMPO 0.33U J 50V
OR	403 115 1007	MT-POLYEST 0.33U J 63V
D7001	407 007 9904	DIODE GMA01-BT

LOCATION	PARTS NO.	DESCRIPTION
D7001	407 012 4406	DIODE 1SS133-T-77
D7002	407 053 3109	ZENER DIODE MTZ12A-T-77
IC701	409 148 5005	IC M6M80021P
OR	409 151 7904	IC M6M80011P
IC702	409 019 6209	IC LA7910
IC703	409 026 8203	IC L5631
OR	409 057 5103	IC UPC574J
Q7001	405 016 5009	TR 2SC2960-F
Q7002	405 006 7006	TR 2SA984K-E-AA
OR	405 006 7204	TR 2SA984K-F-AA
R7001	401 019 1901	CARBON 3.9K JA 1/4W
R7002	401 012 6903	CARBON 10K JA 1/4W
R7003	401 012 6903	CARBON 10K JA 1/4W
R7004	401 018 4804	CARBON 33K JA 1/4W
R7005	401 020 2805	CARBON 47K JA 1/4W
R7006	401 016 4707	CARBON 22K JA 1/4W
R7007	401 020 1907	CARBON 4.7K JA 1/4W
R7008	401 023 1607	CARBON 820 JA 1/4W
R7009	401 018 3708	CARBON 3.3K JA 1/4W
R7010	401 014 5102	CARBON 15K JA 1/4W

RF CONVERTER CIRCUIT

LOCATION	PARTS NO.	DESCRIPTION
C6601	403 038 1603	ELECT 100U M 6.3V
C6602	403 038 1603	ELECT 100U M 6.3V
D6601	407 004 9709	DIODE DSK10C-BT
OR	407 005 8701	DIODE ERA15-02A-V5
L6601	613 015 6631	HF CHOKE 15UH K
L6602	613 015 6631	HF CHOKE 15UH K

COMPL,VD-1

LOCATION	PARTS NO.	DESCRIPTION
COMPL.NO.	613 077 1810	
B1001	405 003 7207	TR 2SA1342-TB
OR	405 000 1109	TR DTA124EK-T96
B1002	405 018 2006	TR 2SC3396-TB
B1201	405 018 2006	TR 2SC3396-TB
B1202	405 018 2006	TR 2SC3396-TB
C1002	403 134 7509	CERAMIC 5P J 50V
C1003	403 024 7206	CERAMIC 390P J 50V
C1004	403 009 5807	CERAMIC 100P J 50V
C1005	403 026 2902	CERAMIC 47P J 50V
C1006	403 048 6902	ELECT 0.47U M 50V
C1007	403 033 4609	CERAMIC 82P J 50V
C1008	403 017 5004	CERAMIC 200P J 50V
C1009	403 048 6902	ELECT 0.47U M 50V
C1010	403 048 6902	ELECT 0.47U M 50V
C1011	403 048 4809	ELECT 0.33U M 50V
C1012	403 022 8304	CERAMIC 33P J 50V
C1013	403 011 5000	CERAMIC 120P J 50V
C1014	403 009 5807	CERAMIC 100P J 50V
C1016	403 063 2200	POLYESTER 0.068U K 50V
C1017	403 069 5601	CERAMIC 0.01U K 50V
C1018	403 069 5601	CERAMIC 0.01U K 50V
C1019	403 068 0409	CERAMIC 0.1U Z 25V
C1020	403 039 2609	ELECT 47U M 6.3V
C1021	403 050 0509	ELECT 2.2U M 50V
C1022	403 041 9405	ELECT 10U M 16V
C1023	403 050 0509	ELECT 2.2U M 50V
C1024	403 024 2102	CERAMIC 39P J 50V
C1025	403 031 2201	CERAMIC 680P J 50V
C1026	403 048 6902	ELECT 0.47U M 50V
C1027	403 069 5601	CERAMIC 0.01U K 50V
C1028	403 017 1006	CERAMIC 20P J 50V
C1029	403 074 3104	CERAMIC 0.047U Z 50V
C1101	403 069 5601	CERAMIC 0.01U K 50V
C1102	403 041 2109	ELECT 47U M 10V
C1103	403 041 2109	ELECT 47U M 10V
C1104	403 069 5601	CERAMIC 0.01U K 50V
C1105	403 049 0800	ELECT 1U M 50V
C1106	403 022 8304	CERAMIC 33P J 50V
C1107	403 134 7509	CERAMIC 5P J 50V
C1108	403 028 4201	CERAMIC 56P J 50V
C1109	403 051 0607	ELECT 4.7U M 50V
C1110	403 069 5601	CERAMIC 0.01U K 50V
C1111	403 069 5601	CERAMIC 0.01U K 50V
C1112	403 069 5601	CERAMIC 0.01U K 50V
C1113	403 069 5601	CERAMIC 0.01U K 50V
C1201	403 028 0203	CERAMIC 51P J 50V
C1202	403 073 4201	CERAMIC 3900P K 50V
C1203	403 049 0800	ELECT 1U M 50V
C1204	403 012 6907	CERAMIC 15P J 50V
C1205	403 059 6007	POLYESTER 0.022U K 50V
C1206	403 049 0800	ELECT 1U M 50V
C1207	403 024 2102	CERAMIC 39P J 50V
C1208	403 074 3104	CERAMIC 0.047U Z 50V
C1209	403 039 2609	ELECT 47U M 6.3V
C1210	403 028 0203	CERAMIC 51P J 50V
C1211	403 069 5601	CERAMIC 0.01U K 50V
C1212	403 017 5004	CERAMIC 200P J 50V
C1213	403 049 0800	ELECT 1U M 50V
C1214	403 013 3103	CERAMIC 150P J 50V
C1215	403 013 3103	CERAMIC 150P J 50V
C1216	403 002 2902	CERAMIC 0.01U M 25V
C1217	403 074 3104	CERAMIC 0.047U Z 50V
C1218	403 009 5807	CERAMIC 100P J 50V
C1219	403 049 0800	ELECT 1U M 50V
C1220	403 039 2708	ELECT 47U M 6.3V
C1221	403 074 3104	CERAMIC 0.047U Z 50V
C1222	403 069 5601	CERAMIC 0.01U K 50V
C1223	403 072 1607	CERAMIC 0.022U K 50V
C1224	403 069 5601	CERAMIC 0.01U K 50V
C1225	403 069 5601	CERAMIC 0.01U K 50V
C1226	403 049 0800	ELECT 1U M 50V
C1227	403 069 5601	CERAMIC 0.01U K 50V
C1228	403 069 5601	CERAMIC 0.01U K 50V
C1229	403 022 2708	CERAMIC 30P J 50V
C1230	403 069 5601	CERAMIC 0.01U K 50V
C1231	403 069 5601	CERAMIC 0.01U K 50V
C1232	403 069 5601	CERAMIC 0.01U K 50V
C1233	403 028 9909	CERAMIC 560P J 50V
C1234	403 069 5601	CERAMIC 0.01U K 50V
C1235	403 069 5710	CERAMIC 0.01U K 50V
C1236	403 069 5601	CERAMIC 0.01U K 50V
C1237	403 013 3103	CERAMIC 150P J 50V
C1238	403 020 8108	CERAMIC 3P C 50V
C1239	403 040 2209	ELECT 22U M 10V
C1501	403 049 0800	ELECT 1U M 50V
C1502	403 038 9708	ELECT 330U M 6.3V
C1503	403 047 0604	ELECT 4.7U M 25V
C1504	403 039 2609	ELECT 47U M 6.3V
D1001	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1101	407 070 8408	ZENER DIODE GZS9.1Y-TB
OR	407 053 8906	ZENER DIODE MTZ9.1C-T-77
D1102	407 051 7802	ZENER DIODE GZS7.5Y-BT
OR	407 053 8104	ZENER DIODE MTZ7.5C-T-77
D1501	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
D1502	407 051 6706	ZENER DIODE GZS5.1Y-BT
OR	407 053 6407	ZENER DIODE MTZ5.1C-T-77

LOCATION	PARTS NO.	DESCRIPTION
D1503	407 003 4507	DIODE DAP202K-T-96
DL121	613 077 4118	DELAY.2H
F1001	613 004 5539	LC PACK 4MHZ LPF
F1201	613 079 2402	FILTER
F1202	613 082 5551	FILTER 1.4MHZ LPF
IC101	409 156 6902	IC LA7322-N
IC111	409 148 4800	IC TL8709P
IC121	409 074 5803	IC TA8632N
J1051	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1052	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1053	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1054	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1055	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1056	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1057	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1058	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1059	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1060	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1061	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1062	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1063	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1064	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1065	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1066	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1067	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1068	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1069	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1070	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1071	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1073	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1074	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1075	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1076	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
J1077	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1078	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1079	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1080	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1081	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1082	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1083	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1084	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1085	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1086	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1087	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
J1088	401 037 5004	MT-GLAZE 0.000 ZA 1/10W
L1001	613 014 1187	HF CHOKE
L1002	613 015 6730	HF CHOKE 100UH K
L1003	613 014 0975	HF CHOKE 100UH K
L1101	613 014 0944	HF CHOKE 56UH K
L1102	613 014 0913	HF CHOKE 33UH K
L1201	613 014 1118	HF CHOKE 18UH J
L1202	613 014 1088	HF CHOKE 10UH J
L1203	613 014 0999	HF CHOKE 150UH K
L1204	613 014 0906	HF CHOKE 27UH K
L1205	613 014 0876	HF CHOKE 15UH K
L1209	613 015 7409	HF CHOKE 100UH K
Q1001	405 001 9906	TR 2SA1037K-T96-FQ
OR	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
OR	405 002 0001	TR 2SA1037K-FR-T96
Q1002	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB

LOCATION	PARTS NO.	DESCRIPTION
Q1002	405 014 4103	TR 2SC2412K-BR-T96
Q1003	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1101	405 001 9906	TR 2SA1037K-T96-FQ
OR	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
OR	405 002 0001	TR 2SA1037K-FR-T96
Q1102	405 001 9906	TR 2SA1037K-T96-FQ
OR	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
OR	405 002 0001	TR 2SA1037K-FR-T96
Q1201	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1202	405 001 9906	TR 2SA1037K-T96-FQ
OR	405 002 6508	TR 2SA1179-M5-TB
OR	405 002 6706	TR 2SA1179-M6-TB
OR	405 002 0001	TR 2SA1037K-FR-T96
Q1203	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1204	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1205	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1206	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1501	405 043 6000	TR 2SC3807
Q1502	405 006 6504	TR 2SA984-E-AA
OR	405 006 6702	TR 2SA984-F-AA
Q1503	405 014 4004	TR 2SC2412K-T96-BQ
OR	405 015 8407	TR 2SC2812-L5-TB
OR	405 015 8704	TR 2SC2812-L6-TB
OR	405 014 4103	TR 2SC2412K-BR-T96
Q1504	405 006 6504	TR 2SA984-E-AA
OR	405 006 6702	TR 2SA984-F-AA
Q1505	405 009 7003	TR 2SB985-T-AE
Q1506	405 019 2005	TR 2SC536-E-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8401	TR 2SC1740S-DCTP-Q
OR	405 011 8500	TR 2SC1740S-DCTP-R
Q1507	405 006 6504	TR 2SA984-E-AA
OR	405 006 6702	TR 2SA984-F-AA
Q1508	405 019 3903	TR 2SC536-G-SPA-AC
OR	405 019 2807	TR 2SC536-F-SPA-AC
OR	405 011 8500	TR 2SC1740S-DCTP-R
OR	405 011 8609	TR 2SC1740S-DCTP-S
R1001	401 037 5400	MT-GLAZE 1K JA 1/10W
R1002	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1003	401 038 9001	MT-GLAZE 680 JA 1/10W
R1004	401 038 7601	MT-GLAZE 560 JA 1/10W
R1005	401 037 5806	MT-GLAZE 1M JA 1/10W
R1006	401 037 5400	MT-GLAZE 1K JA 1/10W
R1007	401 038 3009	MT-GLAZE 3K JA 1/10W
R1008	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1009	401 039 0908	MT-GLAZE 910 JA 1/10W
R1010	401 038 0107	MT-GLAZE 2K JA 1/10W
R1011	401 037 5806	MT-GLAZE 1M JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R1012	401 037 5806	MT-GLAZE 1M JA 1/10W
R1013	401 038 9704	MT-GLAZE 7.5K JA 1/10W
R1014	401 039 0403	MT-GLAZE 8.2K JA 1/10W
R1015	401 037 6704	MT-GLAZE 1.2K JA 1/10W
R1018	401 038 3702	MT-GLAZE 33K JA 1/10W
R1019	401 037 8104	MT-GLAZE 150K JA 1/10W
R1020	401 022 1806	CARBON 680 JA 1/4W
R1021	401 037 5400	MT-GLAZE 1K JA 1/10W
R1022	401 037 8005	MT-GLAZE 15K JA 1/10W
R1023	401 038 3108	MT-GLAZE 30K JA 1/10W
R1024	401 037 5400	MT-GLAZE 1K JA 1/10W
R1025	401 037 5400	MT-GLAZE 1K JA 1/10W
R1026	401 037 9200	MT-GLAZE 1.8K JA 1/10W
R1027	401 038 6604	MT-GLAZE 470K JA 1/10W
R1028	401 035 4900	MT-GLAZE 1K JA 1/8W
R1029	401 016 3700	CARBON 2.2K JA 1/4W
R1030	401 035 4108	MT-GLAZE 0.000 ZA 1/8W
R1101	401 020 7404	CARBON 51 JA 1/4W
R1102	401 021 1807	CARBON 560 JA 1/4W
R1103	401 037 5400	MT-GLAZE 1K JA 1/10W
R1104	401 037 5400	MT-GLAZE 1K JA 1/10W
R1105	401 038 0701	MT-GLAZE 2.2K JA 1/10W
R1106	401 020 7404	CARBON 51 JA 1/4W
R1107	401 019 9501	CARBON 47 JA 1/4W
R1201	401 037 5400	MT-GLAZE 1K JA 1/10W
R1202	401 038 6505	MT-GLAZE 47K JA 1/10W
R1203	401 038 5102	MT-GLAZE 3.9K JA 1/10W
R1204	401 035 5204	MT-GLAZE 10K JA 1/8W
R1205	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1206	401 037 5400	MT-GLAZE 1K JA 1/10W
R1207	401 038 3801	MT-GLAZE 330K JA 1/10W
R1208	401 038 3207	MT-GLAZE 300K JA 1/10W
R1209	401 038 3702	MT-GLAZE 33K JA 1/10W
R1210	401 038 3009	MT-GLAZE 3K JA 1/10W
R1211	401 038 0107	MT-GLAZE 2K JA 1/10W
R1212	401 038 3009	MT-GLAZE 3K JA 1/10W
R1213	401 038 6307	MT-GLAZE 470 JA 1/10W
R1214	401 037 5400	MT-GLAZE 1K JA 1/10W
R1215	401 037 5400	MT-GLAZE 1K JA 1/10W
R1216	401 038 7601	MT-GLAZE 560 JA 1/10W
R1217	401 038 3504	MT-GLAZE 330 JA 1/10W
R1218	401 012 5609	CARBON 1K JA 1/4W
R1219	401 037 8005	MT-GLAZE 15K JA 1/10W
R1220	401 037 8005	MT-GLAZE 15K JA 1/10W
R1221	401 038 2002	MT-GLAZE 270 JA 1/10W
R1222	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1223	401 036 5104	MT-GLAZE 33K JA 1/8W
R1224	401 038 6307	MT-GLAZE 470 JA 1/10W
R1225	401 037 7909	MT-GLAZE 1.5K JA 1/10W
R1226	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1227	401 037 8609	MT-GLAZE 1.6K JA 1/10W
R1229	401 038 7601	MT-GLAZE 560 JA 1/10W
R1230	401 037 5400	MT-GLAZE 1K JA 1/10W
R1231	401 038 7601	MT-GLAZE 560 JA 1/10W
R1232	401 037 5400	MT-GLAZE 1K JA 1/10W
R1233	401 037 6803	MT-GLAZE 12K JA 1/10W
R1234	401 037 5400	MT-GLAZE 1K JA 1/10W
R1235	401 035 6607	MT-GLAZE 120 JA 1/8W
R1236	401 035 4900	MT-GLAZE 1K JA 1/8W
R1237	401 038 9001	MT-GLAZE 680 JA 1/10W
R1238	401 038 9001	MT-GLAZE 680 JA 1/10W
R1241	401 037 5608	MT-GLAZE 10K JA 1/10W
R1242	401 038 3603	MT-GLAZE 3.3K JA 1/10W
R1501	401 036 8105	MT-GLAZE 470 JA 1/8W
R1502	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1503	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1504	401 038 6505	MT-GLAZE 47K JA 1/10W
R1505	401 038 6505	MT-GLAZE 47K JA 1/10W
R1506	401 038 2101	MT-GLAZE 2.7K JA 1/10W

LOCATION	PARTS NO.	DESCRIPTION
R1507	401 038 2101	MT-GLAZE 2.7K JA 1/10W
R1508	401 036 2806	MT-GLAZE 2.7K JA 1/8W
R1509	401 036 1403	MT-GLAZE 220 JA 1/8W
R1510	401 035 9301	MT-GLAZE 1.8K JA 1/8W
R1511	401 038 6505	MT-GLAZE 47K JA 1/10W
R1512	401 020 2805	CARBON 47K JA 1/4W
R1513	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1514	401 038 9308	MT-GLAZE 68K JA 1/10W
R1515	401 038 6406	MT-GLAZE 4.7K JA 1/10W
R1516	401 038 6406	MT-GLAZE 4.7K JA 1/10W
VR101	613 001 9424	SEMI VR 20KB
OR	613 001 9059	SEMI VR 22KB
VR102	613 001 9417	SEMI VR 10KB
OR	613 001 9035	SEMI VR 10KB
VR103	613 001 9394	SEMI VR 3KB
OR	613 001 9004	SEMI VR 3.3KB
VR104	613 001 9417	SEMI VR 10KB
OR	613 001 9035	SEMI VR 10KB
VR111	613 001 9370	SEMI VR 1KB
OR	613 001 8977	SEMI VR 1KB
VR121	613 001 9448	SEMI VR 50KB
OR	613 001 9073	SEMI VR 47KB
X1201	613 002 7818	CRYSTAL 4.433619MHZ 16PF
OR	613 002 7900	CRYSTAL

COMPL.VD-2

COMPL.NO. 613 078 6197

LOCATION	PARTS NO.	DESCRIPTION
C1301	403 001 1906	CERAMIC 0.01U M 16V
C1302	403 001 1906	CERAMIC 0.01U M 16V
C1303	403 001 1906	CERAMIC 0.01U M 16V
C1304	403 039 2609	ELECT 47U M 6.3V
C1305	403 030 6309	CERAMIC 68P J 50V
C1306	403 046 2104	ELECT 3.3U M 25V
C1307	403 046 2104	ELECT 3.3U M 25V
C1308	403 047 0604	ELECT 4.7U M 25V
C1309	403 038 2006	ELECT 100U M 6.3V
D1301	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE 6MA01-BT
D1302	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE 6MA01-BT
IC131	409 074 3502	IC LA7311
L1301	613 015 6730	HF CHOKE 100UH K
R1301	401 013 6308	CARBON 12K JA 1/4W
R1302	401 012 9201	CARBON 1M JA 1/4W
R1303	401 012 5609	CARBON 1K JA 1/4W
R1304	401 013 6308	CARBON 12K JA 1/4W
R1305	401 012 9201	CARBON 1M JA 1/4W
R1306	401 012 6903	CARBON 10K JA 1/4W
R1307	401 023 1607	CARBON 820 JA 1/4W
R1308	401 105 3701	CARBON 18K JA 1/4W
R1309	401 016 4707	CARBON 22K JA 1/4W
R1310	401 016 4707	CARBON 22K JA 1/4W

COMPL.VP-1

COMPL.NO. 613 077 1735

LOCATION	PARTS NO.	DESCRIPTION
C1801	403 072 8200	CERAMIC 330P K 50V
C1802	403 068 9402	CERAMIC 100P K 50V
C1803	403 003 3304	CERAMIC 0.022U M 25V
C1804	403 049 0800	ELECT 1U M 50V
C1805	403 003 1805	CERAMIC 2200P M 25V
C1806	403 003 7104	CERAMIC 0.033U M 25V

LOCATION	PARTS NO.	DESCRIPTION
C1807	403 009 1809	CERAMIC 10P J 50V
C1808	403 014 2600	CERAMIC 18P J 50V
C1809	403 003 7104	CERAMIC 0.033U M 25V
C1810	403 003 1805	CERAMIC 2200P M 25V
C1811	403 039 2609	ELECT 47U M 6.3V
C1812	403 001 1906	CERAMIC 0.01U M 16V
C1813	403 014 2600	CERAMIC 18P J 50V
C1814	403 075 3103	CERAMIC 82P J 50V
C1815	403 071 2001	CERAMIC 180P K 50V
C1816	403 022 7703	CERAMIC 33P J 50V
C1817	403 001 1906	CERAMIC 0.01U M 16V
C1818	403 043 9601	ELECT 47U M 16V
C1819	403 001 1906	CERAMIC 0.01U M 16V
C1820	403 003 3304	CERAMIC 0.022U M 25V
C1821	403 001 1906	CERAMIC 0.01U M 16V
C1822	403 001 1906	CERAMIC 0.01U M 16V
C1823	403 069 1207	CERAMIC 1000P K 50V
D1801	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC181	409 134 2001	IC LA7320
L1801	613 014 0968	HF CHOKE 82UH K
L1802	613 014 0951	HF CHOKE 68UH K
L1803	613 015 6730	HF CHOKE 100UH K
L1804	613 014 0883	HF CHOKE 18UH K
L1805	613 014 0876	HF CHOKE 15UH K
L1806	613 014 1033	HF CHOKE 3.9UH J
L1807	613 014 0937	HF CHOKE 47UH K
L1808	613 015 6730	HF CHOKE 100UH K
Q1801	405 016 1100	TR 2SC2839-F-SPA-AC
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 012 9506	TR 2SC2058S-DCTP-Q
Q1802	405 016 1100	TR 2SC2839-F-SPA-AC
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 012 9506	TR 2SC2058S-DCTP-Q
Q1803	405 016 1100	TR 2SC2839-F-SPA-AC
OR	405 016 0905	TR 2SC2839-E-SPA-AC
OR	405 015 2603	TR 2SC2669-Y-TPE4
OR	405 015 2504	TR 2SC2669-O-TPE4
OR	405 012 9506	TR 2SC2058S-DCTP-Q
R1801	401 013 5202	CARBON 1.2K JA 1/4W
R1802	401 016 2505	CARBON 220 JA 1/4W
R1804	401 020 5509	CARBON 5.1 JA 1/4W
R1806	401 013 5202	CARBON 1.2K JA 1/4W
R1807	401 016 3700	CARBON 2.2K JA 1/4W
R1808	401 020 0702	CARBON 470 JA 1/4W
R1809	401 019 0904	CARBON 390 JA 1/4W
R1810	401 012 4404	CARBON 100 JA 1/4W
R1811	401 021 1807	CARBON 560 JA 1/4W
R1812	401 023 1607	CARBON 820 JA 1/4W
R1813	401 019 0904	CARBON 390 JA 1/4W
R1814	401 019 0904	CARBON 390 JA 1/4W
R1815	401 016 3700	CARBON 2.2K JA 1/4W
R1816	401 016 3700	CARBON 2.2K JA 1/4W
R1817	401 012 5609	CARBON 1K JA 1/4W
R1818	401 015 1509	CARBON 180 JA 1/4W
VR181	613 002 0345	SEMI VR 1KB
VR182	613 002 0345	SEMI VR 1KB

LOCATION	PARTS NO.	DESCRIPTION
COMPL.AD-1		
COMPL.NO.	613 079 7421	VHR-4100G
COMPL.NO.	613 079 7438	VHR-4100EX.EV
C2001	403 049 0008	ELECT 1U M 50V
C2002	403 075 4506	CERAMIC 820P K 50V
C2004	403 038 8602	ELECT 33U M 6.3V
C2005	403 003 0600	CERAMIC 0.018U K 25V
C2006	403 048 6308	ELECT 0.47U M 50V
C2007	403 001 7007	CERAMIC 3900P K 16V
C2008	403 001 6505	CERAMIC 3300P K 16V
C2009	403 039 2104	ELECT 47U M 6.3V
C2010	403 041 8804	ELECT 10U M 16V
C2013	403 003 2406	CERAMIC 0.022U J 25V
C2015	403 046 9905	ELECT 4.7U M 25V
C2016	403 049 0008	ELECT 1U M 50V
C2017	403 043 3906	ELECT 33U M 16V
C2018	403 046 9905	ELECT 4.7U M 25V
C2019	403 043 9106	ELECT 47U M 16V
C2020	403 071 6207	CERAMIC 220P K 50V
C2021	403 081 7409	POLYPRO 0.033U J 100V
C2022	403 002 1905	CERAMIC 0.01U K 25V
C2024	403 002 1905	CERAMIC 0.01U K 25V
C2025	403 003 3700	CERAMIC 0.022U Z 25V
C2030	403 049 0008	ELECT 1U M 50V
C2031	403 049 0008	ELECT 1U M 50V
C2032	403 049 0008	ELECT 1U M 50V
C2033	403 043 3906	ELECT 33U M 16V
C2034	403 049 0008	ELECT 1U M 50V
C2051	403 069 1207	CERAMIC 1000P K 50V. VHR-4100G ONLY
C2052	403 001 4006	CERAMIC 1500P M 16V. VHR-4100G ONLY
C2053	403 068 9402	CERAMIC 100P K 50V. VHR-4100G ONLY
C2054	403 068 9402	CERAMIC 100P K 50V. VHR-4100G ONLY
C2075	403 046 1602	ELECT 3.3U M 25V
D2002	407 012 4406	DIODE 1SS133-T-77
OR	407 007 9904	DIODE GMA01-BT
IC201	409 133 1401	IC LA7294
IC202	409 018 7603	IC LA7016
L2001	613 015 5474	HF CHOKE 27MH
L2002	613 014 3037	HF CHOKE 10MH J
L2003	613 015 8550	CHOKE COIL
L2051	613 017 0316	CORE VHR-4100G ONLY
L2052	613 017 0316	CORE VHR-4100G ONLY
L2053	613 015 7492	HF CHOKE 560UH K.VHR-4100G ONLY
Q2001	405 024 9709	TR 2SD734-E-AA
OR	405 024 9907	TR 2SD734-F-AA
R2001	401 012 4404	CARBON 100 JA 1/4W
R2002	401 022 3008	CARBON 6.8K JA 1/4W
R2003	401 013 4106	CARBON 120 JA 1/4W
R2004	401 019 3905	CARBON 390K JA 1/4W
R2005	401 021 8905	CARBON 6.2K JA 1/4W
R2006	401 017 1705	CARBON 2.7K JA 1/4W
R2007	401 023 2703	CARBON 8.2K JA 1/4W
R2008	401 017 1705	CARBON 2.7K JA 1/4W
R2009	401 018 6501	CARBON 3.3M JA 1/4W
R2010	401 012 6903	CARBON 10K JA 1/4W
R2011	401 023 7401	CARBON 9.1K JA 1/4W
R2012	401 019 7705	CARBON 4.3K JA 1/4W
R2013	401 012 5609	CARBON 1K JA 1/4W
R2014	401 015 2605	CARBON 1.8K JA 1/4W

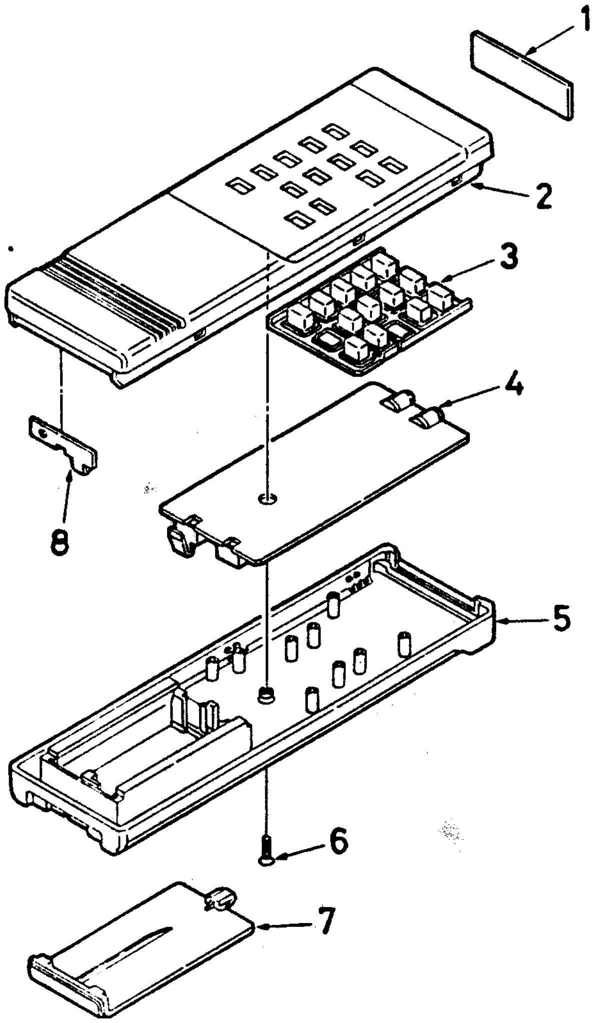
LOCATION	PARTS NO.	DESCRIPTION
R2016	401 012 6903	CARBON 10K JA 1/4W
R2017	401 012 6903	CARBON 10K JA 1/4W
R2018	401 015 3800	CARBON 18K JA 1/4W
R2021	401 012 3308	CARBON 10 JA 1/4W
R2022	401 019 9501	CARBON 47 JA 1/4W
R2023	401 014 5102	CARBON 15K JA 1/4W
R2024	401 019 6104	CARBON 4.7 JA 1/4W
R2034	401 012 4404	CARBON 100 JA 1/4W
R2041	401 020 1907	CARBON 4.7K JA 1/4W
T2001	613 016 2205	OSC COIL
VR201	613 002 0468	SEMI VR 100KB
VR202	613 002 0406	SEMI VR 10KB
SY-4		
COMPL.NO.	613 080 9124	
B3301	405 063 9708	TR DTC144EL-TL2
B3302	405 063 9708	TR DTC144EL-TL2
B3303	405 063 9104	TR DTA144EL-TL2
C3301	403 043 1902	ELECT 2200MF M 16V
OR	403 043 3104	ELECT 2200MF M 16V
C3302	403 042 2405	ELECT 100MF M 16V
D3301	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3302	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3303	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3304	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3305	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3306	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3307	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3308	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3309	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D3310	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
R3301	401 016 4707	CARBON 22K JA 1/4W
R3302	401 019 1802	CARBON 3.9K JA 1/4W
R3303	401 012 5609	CARBON 1K JA 1/4W
R3304	401 012 5609	CARBON 1K JA 1/4W
R3305	401 012 5609	CARBON 1K JA 1/4W
R3307	401 012 6903	CARBON 10K JA 1/4W
COMPL.PW-1		
COMPL.NO.	613 077 1803	VHR-4100G
COMPL.NO.	613 080 3627	VHR-4100EX.EV
	613 052 5543	FUSE HOLDER
	613 041 5967	COVER.F5001
	613 041 5967	COVER.F5102
C5001 ⚠	404 031 1201	MT-COMPO 4700P M 250V
C5101	403 046 0605	ELECT 2200U M 25V
OR	403 045 9807	ELECT 2200U M 25V
C5102	403 046 0605	ELECT 2200U M 25V
OR	403 045 9807	ELECT 2200U M 25V
C5103	403 097 6304	ELECT 4700U M 16V
OR	403 044 3509	ELECT 4700U M 16V

LOCATION	PARTS NO.	DESCRIPTION
C5104	403 051 3103	ELECT 47U M 50V
C5105	403 110 1408	ELECT 47U M 100V
C5106	403 051 0607	ELECT 4.7U M 50V
C5107	403 054 0703	ELECT 47U M 35V
C5108	403 039 2104	ELECT 47U M 6.3V
C5109	403 043 9106	ELECT 47U M 16V
C5110	403 043 6006	ELECT 330U M 16V
D5101	407 004 9709	DIODE DSK10C-BT
OR	407 005 8701	DIODE ERA15-02A-V5
D5102	407 004 9709	DIODE DSK10C-BT
OR	407 005 8701	DIODE ERA15-02A-V5
D5103	407 004 6708	DIODE DSA17C-KC6
D5104	407 004 6708	DIODE DSA17C-KC6
D5105	407 003 9205	DIODE DBB10-C
D5106	407 078 2705	DIODE 1SS244-T-77
D5107	407 078 2705	DIODE 1SS244-T-77
D5108	407 078 1104	ZENER DIODE MTZ33A-T-77
OR	407 051 6003	ZENER DIODE GZS33X-BT
D5109	407 053 2706	ZENER DIODE MTZ10C-T-77
OR	407 065 1704	ZENER DIODE GZS10Y-BT
D5110	407 078 0305	ZENER DIODE MTZ24B-T-77
OR	407 070 3502	ZENER DIODE GZS24Y-BT
F5001 ⚠	423 004 3004	FUSE 400MA
F5101 ⚠	423 003 3708	FUSE 800MA
F5102 ⚠	423 005 4901	FUSE 1.6A
F5103 ⚠	423 006 1305	FUSE 2A
F5104 ⚠	423 011 8405	FUSE T315MA 250V
L5001 ⚠	613 082 5568	FILTER VHR-4100G ONLY
OR ⚠	613 013 1409	LF CHOKE VHR-4100G ONLY
OR ⚠	613 080 0664	LF CHOKE VHR-4100G ONLY
Q5101	405 006 7204	TR 2SA984K-F-AA
OR	405 006 7006	TR 2SA984K-E-AA
R5102	401 019 7705	CARBON 4.3K JA 1/4W
R5103	401 019 7705	CARBON 4.3K JA 1/4W
R5104	401 016 3700	CARBON 2.2K JA 1/4W
R5105	401 016 3700	CARBON 2.2K JA 1/4W
R5107	401 019 7705	CARBON 4.3K JA 1/4W
R5108 ⚠	402 023 2106	FUSIBLE RES 47 JA 1/4W
R5109	401 013 6308	CARBON 12K JA 1/4W
R5110	401 014 2804	CARBON 150 JA 1/4W
R5111	401 014 2804	CARBON 150 JA 1/4W
COMPL.PW-2		
COMPL.NO.	613 078 6579	
IC521	409 149 6704	IC STK5473
COMPL.TM-1		
COMPL.NO.	613 080 9568	
	613 022 0875	HOLDER.VFD
A7101	613 022 4552	VFD
C7101	403 009 1809	CERAMIC 10P J 50V
C7102	403 017 9705	CERAMIC 22P J 50V
C7103	403 017 9705	CERAMIC 22P J 50V
C7104	403 121 9509	CERAMIC 0.1U Z 50V
C7105	403 042 8407	ELECT 22U M 16V
C7106	403 001 1906	CERAMIC 0.01U M 16V
C7107	403 001 1906	CERAMIC 0.01U M 16V
C7108	403 048 7107	ELECT 0.47U M 50V
C7109	403 121 9509	CERAMIC 0.1U Z 50V
C7110	403 069 0309	CERAMIC 1000P J 50V

LOCATION	PARTS NO.	DESCRIPTION
C7111	403 121 9509	CERAMIC 0.1U Z 50V
C7112	403 001 1906	CERAMIC 0.01U M 16V
CT711	613 002 6576	TRIMMER 20P N450
OR	613 002 6583	TRIMMER 20P N750
D7101	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7102	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7103	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7104	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7105	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7107	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7108	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7109	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7110	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7122	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
D7127	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
IC711	409 152 4902	IC M50957-632SP
IC712	409 032 3308	IC MN1280-L
R7101	401 012 9201	CARBON 1M JA 1/4W
R7102	401 012 9904	CARBON 10M JA 1/4W
R7103	401 018 5702	CARBON 330K JA 1/4W
R7104	401 012 5609	CARBON 1K JA 1/4W
R7106	401 012 5609	CARBON 1K JA 1/4W
R7108	401 012 5609	CARBON 1K JA 1/4W
R7110	401 012 5609	CARBON 1K JA 1/4W
R7113	401 012 5609	CARBON 1K JA 1/4W
R7116	401 016 4707	CARBON 22K JA 1/4W
R7117	401 012 6903	CARBON 10K JA 1/4W
R7118	401 012 5609	CARBON 1K JA 1/4W
R7119	401 012 5609	CARBON 1K JA 1/4W
R7120	401 012 5609	CARBON 1K JA 1/4W
R7122	401 012 5609	CARBON 1K JA 1/4W
R7123	401 012 5609	CARBON 1K JA 1/4W
R7124	401 018 4804	CARBON 33K JA 1/4W
R7125	401 012 5609	CARBON 1K JA 1/4W
RB711	613 017 2877	RESISTOR PACK 10K X6 J
OR	613 079 5892	R-NETWORK.10KX6
RB712	613 017 2853	RESISTOR PACK 10K X4 J
OR	613 079 5878	R-NETWORK.10KX4
RR711	613 000 2204	REMOCON RECEIVER
S7101	613 006 3762	PUSH SWITCH.PLAY
S7102	613 006 3762	PUSH SWITCH.STOP
S7103	613 077 4354	PUSH SWITCH.PAUSE
S7105	613 077 4354	PUSH SWITCH.PROG.
S7106	613 077 4354	PUSH SWITCH.UP
S7107	613 077 4354	PUSH SWITCH.VPS
S7108	613 077 4354	PUSH SWITCH.TR.UP
S7113	613 006 3991	PUSH SWITCH.REC
S7114	613 006 3991	PUSH SWITCH.EJECT
S7117	613 077 4354	PUSH SWITCH.CLK
S7118	613 077 4354	PUSH SWITCH.DOWN
S7120	613 077 4354	PUSH SWITCH.TR.DOWN

LOCATION	PARTS NO.	DESCRIPTION
S7125	613 006 3762	PUSH SWITCH.REW
S7126	613 006 3762	PUSH SWITCH.FF
S7129	613 077 4354	PUSH SWITCH.PRESET
S7130	613 077 4354	PUSH SWITCH.OK
S7137	613 077 4354	PUSH SWITCH.ALL CLEAR
X7101	613 022 4569	CRYSTAL 6.291456MHZ
X7102	613 002 8457	CRYSTAL 32.768KHZ
OR	613 002 8594	CRYSTAL 32.768KHZ
COMPL.TM-3		
COMPL.NO.	613 077 1599	VHR-4100G.EV
COMPL.NO.	613 080 9575	VHR-4100EX
B7301	405 003 7603	TR 2SA1345-AC
OR	405 000 2205	TR DTA144ES-DCTP
B7302	405 018 2501	TR 2SC3399-AC
OR	405 000 6104	TR DTC144ES-DCTP
C7301	403 042 7707	ELECT 22U M 16V
C7302	403 048 4205	ELECT 0.33U M 50V
C7303	403 041 8804	ELECT 10U M 16V
C7304	403 048 4205	ELECT 0.33U M 50V
C7305	403 001 5003	CERAMIC 2200P K 16V
C7306	403 069 1207	CERAMIC 1000P K 50V
C7307	403 042 7707	ELECT 22U M 16V
C7308	403 121 9509	CERAMIC 0.1U Z 50V
C7309	403 057 2407	POLYESTER 0.1U J 50V
C7310	403 003 6701	CERAMIC 0.033U K 25V
C7311	403 155 2804	DL-ELECT 0.047F Z 5.5V
C7312	403 070 7205	CERAMIC 150P J 50V
D7301	407 007 9904	DIODE GMA01-BT
OR	407 012 4406	DIODE 1SS133-T-77
IC731	409 114 4308	IC LA7214
IC732	409 148 5104	IC SDA5642.WITHOUT VHR-4100EX
Q7301	405 009 7003	TR 2SB985-T-AE
Q7302	405 057 6409	TR 2SC4038-R-TL2
OR	405 057 6300	TR 2SC4038-S-TL2
Q7303	405 027 8709	TR 2SK68A-K
OR	405 057 9301	TR 2SK68A-L1
R7301	401 020 2805	CARBON 47K JA 1/4W
R7302	401 013 5202	CARBON 1.2K JA 1/4W
R7303	401 012 5609	CARBON 1K JA 1/4W
R7304	401 012 6903	CARBON 10K JA 1/4W
R7305	401 012 9201	CARBON 1M JA 1/4W
R7308	401 012 6903	CARBON 10K JA 1/4W
R7309	401 020 3802	CARBON 470K JA 1/4W
R7310	401 018 5702	CARBON 330K JA 1/4W
R7311	401 018 2701	CARBON 330 JA 1/4W
R7312	401 018 5702	CARBON 330K JA 1/4W
R7313	401 017 3709	CARBON 270K JA 1/4W
R7314	401 012 8006	CARBON 100K JA 1/4W
R7315	401 012 6903	CARBON 10K JA 1/4W
R7316	401 012 4404	CARBON 100 JA 1/4W
R7317	401 021 2903	CARBON 5.6K JA 1/4W
R7318	401 023 4509	CARBON 820K JA 1/4W
R7319	401 012 8006	CARBON 100K JA 1/4W
R7320	401 012 9201	CARBON 1M JA 1/4W
R7321	401 017 8506	CARBON 300 JA 1/4W
R7322	401 015 1509	CARBON 180 JA 1/4W
R7323	401 023 4509	CARBON 820K JA 1/4W
R7324	401 016 3700	CARBON 2.2K JA 1/4W

LOCATION	PARTS NO.	DESCRIPTION
COMPL.TB-1		
COMPL.NO.	613 080 3610	
VR851	613 080 5928	VR.ROTARY 100K B
REMOCON		
COMPL.NO.	613 077 4385	
1	613 040 5180	SIGN WINDOW
2	613 080 0251	ASSY.CABINET.TOP
3	613 080 0299	BUTTON
4	613 080 0022	COMPL.RM-1
5	613 040 0468	BOTTOM LID
6	411 101 7308	SCR S-TPG FLT 2.6X10
7	613 040 1618	BATTERY LID
8	613 052 5321	TERMINAL



LOCATION	PARTS NO.	DESCRIPTION
COMPL.RM-1		
COMPL.NO.	613 080 0022	
	613 052 5338	TERMINAL.POSITIVE
	613 052 5345	TERMINAL.NEGATIVE
C1	403 009 3100	CERAMIC 100P J 50V
C2	403 009 3100	CERAMIC 100P J 50V
C3	403 039 2104	ELECT 47U M 6.3V
D1	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D2	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
D3	407 007 9904	DIODE GMA01
OR	407 012 4406	DIODE 1SS133
IC1	409 073 6207	IC UPD6122G-001
LED1	407 078 3207	LED SLR938C
Q1	405 066 7305	TR 2SC4040-R
OR	405 015 3006	TR 2SC2673-R
R1	401 012 4404	CARBON 100 JA 1/4W
R2	401 012 1007	CARBON 1.5 JA 1/4W
X1	613 016 6913	CERAMIC RESONATOR
OR	613 016 6920	CERAMIC RESONATOR

SANYO

A11300 Apr./'88/2800 NS Printed in Japan

SANYO Electric Co., Ltd.
Osaka, Japan

BLOCK DIAGRAMS, CIRCUIT DIAGRAMS & PRINTED CIRCUIT BOARDS

VHR-4100EX (Europe)
VHR-4100EV (Europe)
VHR-4100G (West Germany)

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———	RF CONVERTER CIRCUIT	Ⓗ
———	MECHANISM CONNECTION CIRCUIT	

A11300 DP1/EX, EV, G 84NS

REFERENCE NO. WM-22340

NOTES:

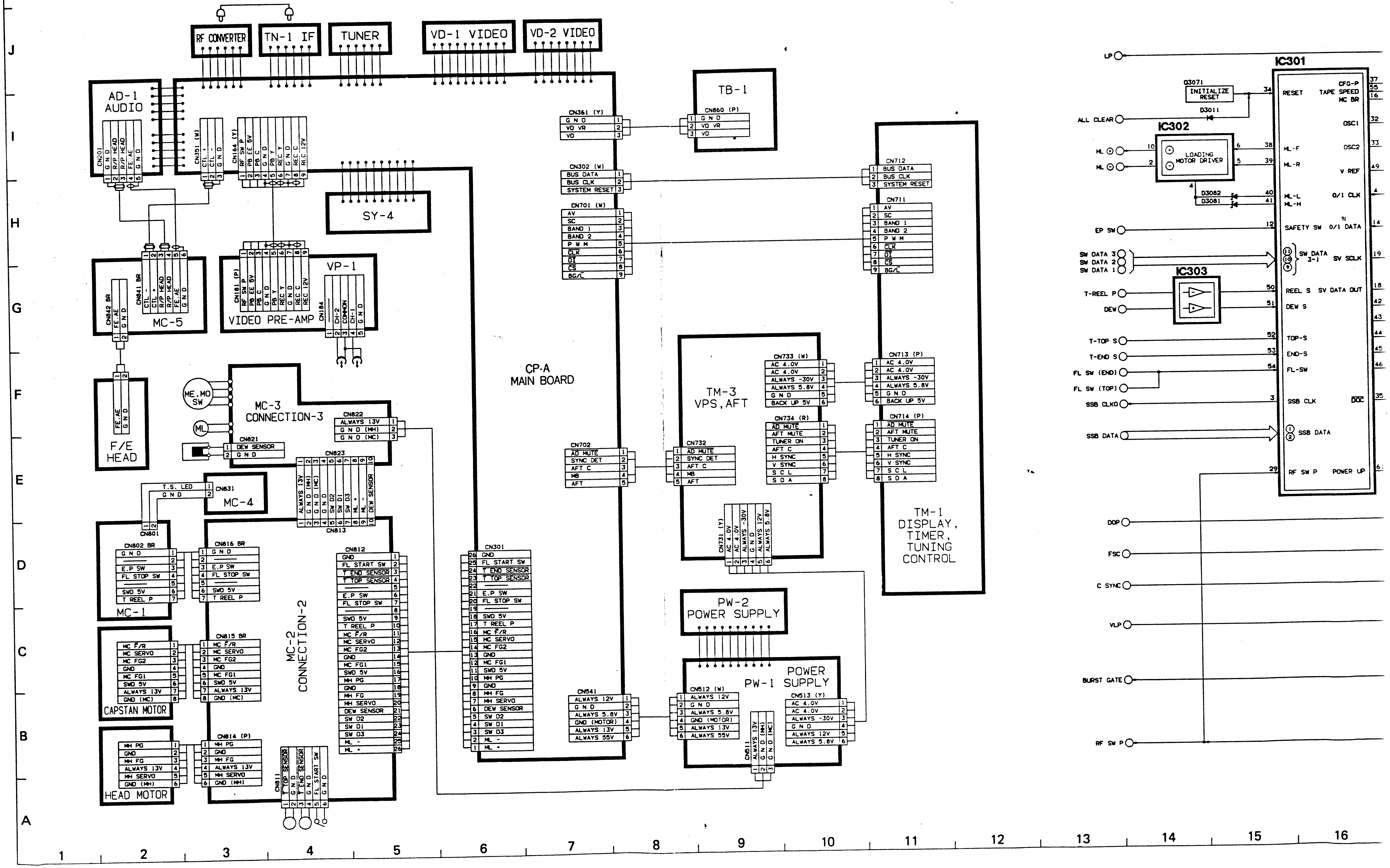
1. All resistance values in "OHMS" unless otherwise noted. (K=1,000 M=1,000,000)
2. All capacitance values in "μfd" unless otherwise noted. p=pico farad
3. All inductance values in "mH" unless otherwise noted. μ=micro henry

PRODUCT SAFETY NOTICE

THE COMPONENTS DESIGNATED BY A SYMBOL (⚠) IN THIS SCHEMATIC DIAGRAM DESIGNATES COMPONENTS WHOSE VALUE ARE OF SPECIAL SIGNIFICANCE TO PRODUCT SAFETY. SHOULD ANY COMPONENT DESIGNATED BY A SYMBOL NEED TO BE REPLACED, USE ONLY THE PART DESIGNATED IN THE PARTS LIST. DO NOT DEVIATE FROM THE RESISTANCE, WATTAGE AND VOLTAGE RATINGS SHOWN.

A

OVERALL WIRING DIAGRAM


RF CONVERTER
TN-1 IF
TUNER
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CN201
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G N D
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R/P HEAD
FE.AE
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CTL -
CN164 (Y)
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PB EE 5V
PB C
G N D
PB Y
REC Y
G N D
REC C
R.C 12V
SY-4
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VD VR
VD
CN361 (Y)
G N D
VD VR
VD
CN302 (W)
BUS DATA
BUS CLK
SYSTEM RESET
CN701 (W)
AV
SC
BAND 1
BAND 2
P W M
CLK
DI
CS
BG/L
CN712
BUS DATA
BUS CLK
SYSTEM RESET
CN711
AV
SC
BAND 1
BAND 2
P W M
CLK
DI
CS
BG/L
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CN842 BR
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CN841 BR
CTL -
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R/P HEAD
FE.AE
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SW D3
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ML -
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CN801
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CN802 BR
G N D
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FL STOP SW
SWD 5V
T REEL P
CN816 BR
G N D
E.P SW
FL STOP SW
SWD 5V
T REEL P
CAPSTAN MOTOR
MC F/R
MC SERVO
MC FG2
GND
MC FG1
SWD 5V
ALWAYS 13V
GND (MC)
CN815 BR
MC F/R
MC SERVO
MC FG2
GND
SWD 5V
ALWAYS 13V
GND (MC)
HEAD MOTOR
MH PG
GND
MH FG
ALWAYS 13V
MH SERVO
GND (MH)
CN814 (P)
MH PG
GND
MH FG
ALWAYS 13V
MH SERVO
GND (MH)
MC-2
CONNECTION-2
CN812
GND
FL START SW
T END SENSOR
T TOP SENSOR
E.P SW
FL STOP SW
SWD 5V
T REEL P
MC F/R
MC SERVO
MC FG2
GND
MC FG1
SWD 5V
MH PG
GND
MH FG
MH SERVO
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FL START SW
G N D
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MH PG
GND
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MH SERVO
DEW SENSOR
SW D2
SW D1
SW D3
ML -
ML +
CN702
AD MUTE
SYNC DET
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MB
AFT
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VPS, AFT
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AC 4.0V
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ALWAYS 5.8V
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BACK UP 5V
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AD MUTE
AFT MUTE
TUNER ON
AFT C
H SYNC
V SYNC
S C L
S D A
CN732
AD MUTE
SYNC DET
AFT C
MB
AFT
CN731 (Y)
AC 4.0V
AC 4.0V
ALWAYS -30V
G N D
ALWAYS 12V
ALWAYS 5.8V
CN713 (P)
AC 4.0V
AC 4.0V
ALWAYS -30V
ALWAYS 5.8V
G N D
BACK UP 5V
CN714 (P)
AD MUTE
AFT MUTE
TUNER ON
AFT C
H SYNC
V SYNC
S C L
S D A
TM-1
DISPLAY,
TIMER,
TUNING
CONTROL
PW-2
POWER SUPPLY
PW-1 POWER SUPPLY
CN541
ALWAYS 12V
G N D
ALWAYS 5.8V
GND (MOTOR)
ALWAYS 13V
ALWAYS 55V
CN512 (W)
ALWAYS 12V
G N D
ALWAYS 5.8V
GND (MOTOR)
ALWAYS 13V
ALWAYS 55V
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AC 4.0V
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ALWAYS 12V
ALWAYS 5.8V
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ALWAYS 13V
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FL SW (TOP)
FL-SW
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SSB CLK
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SSB DATA
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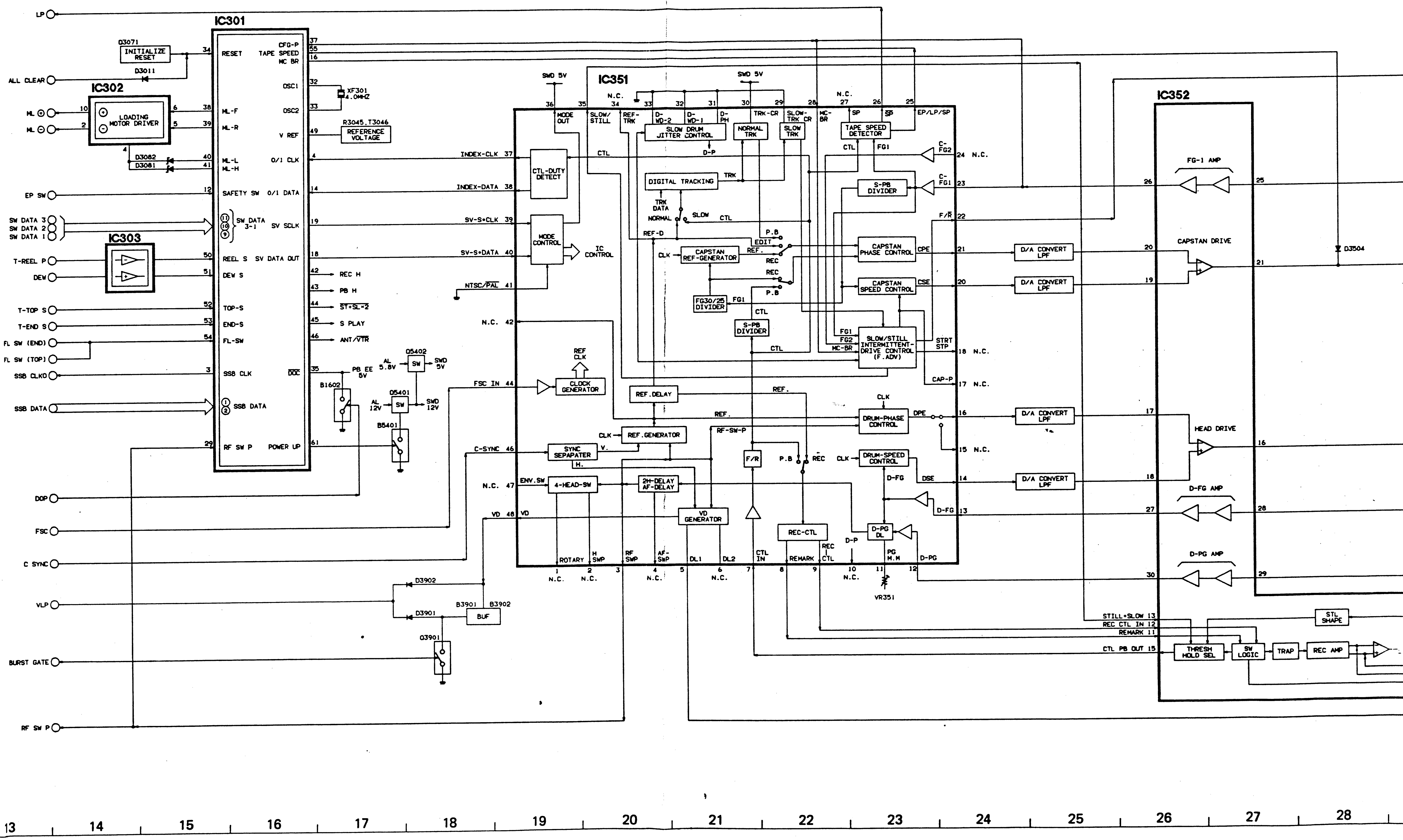
A

SERVO CIRCUIT BASIC BLOCK DIAGRAM


IC301
IC302
IC303
IC351
IC352
LP
ALL CLEAR
ML
EP SW
SW DATA 3
SW DATA 2
SW DATA 1
T-REEL P
DEW
T-TOP S
T-END S
FL SW (END)
FL SW (TOP)
SSB CLKO
SSB DATA
DOP
FSC
C SYNC
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BURST GATE
RF SW P
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LOADING MOTOR DRIVER
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RESET
CFG-P
TAPE SPEED
MC BR
OSC1
OSC2
XF301 4.0MHZ
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REFERENCE VOLTAGE
V REF
ML-F
ML-R
ML-L
ML-H
0/1 CLK
SAFETY SW
0/1 DATA
SW DATA 3-1
SV SCLK
REEL S
SV DATA OUT
DEW S
TOP-S
END-S
FL-SW
SSB CLK
DOC
SSB DATA
RF SW P
POWER UP
REC H
PB H
ST+SL=2
S PLAY
ANT/VTR
PB EE 5V
AL 5.8V
Q5402
SW
SWD 5V
B1602
Q5401
AL 12V
SWD 12V
B5401
D3902
D3901
B3901
B3902
BUF
Q3901
SWD 5V
INDEX-CLK
INDEX-DATA
SV-S-CLK
SV-S-DATA
NTSC/PAL
N.C.
FSC IN
C-SYNC
VD
CTL-DUTY DETECT
MODE CONTROL
IC CONTROL
MODE OUT
SLOW/STILL
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D-WD-2
D-WD-1
D-PH
TRK-CR
SLOW-TRK CR
MC-BR
SP
EP/LP/SP
SLOW DRUM JITTER CONTROL
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
CTL
FG1
C-FG2
C-FG1
D-P
DIGITAL TRACKING
TRK
TRK DATA
NORMAL
SLOW
S-PB DIVIDER
F/R
REF-D
P.B
EDIT
REF.
CLK
CAPSTAN REF-GENERATOR
REC
CAPSTAN PHASE CONTROL
CPE
CAPSTAN SPEED CONTROL
CSE
FG30/25 DIVIDER
S-PB DIVIDER
FG2
MC-BR
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
STRT STP
CAP-P
REF CLK
CLOCK GENERATOR
REF.DELAY
DRUM-PHASE CONTROL
DPE
REF.GENERATOR
RF-SW-P
SYNC SEPAPATER
V.
H.
F/R
DRUM-SPEED CONTROL
D-FG
DSE
ENV.SW
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
REC-CTL
D-PG DL
PG M.M
D-PG
ROTARY
H SWP
RF SWP
AF-SWP
DL1
DL2
CTL IN
REMARK
REC CTL
VR351
D/A CONVERT LPF
FG-1 AMP
CAPSTAN DRIVE
D3504
HEAD DRIVE
D-FG AMP
D-PG AMP
STILL+SLOW
REC CTL IN
REMARK
CTL PB OUT
STL SHAPE
THRESH HOLD SEL
SW LOGIC
TRAP
REC AMP
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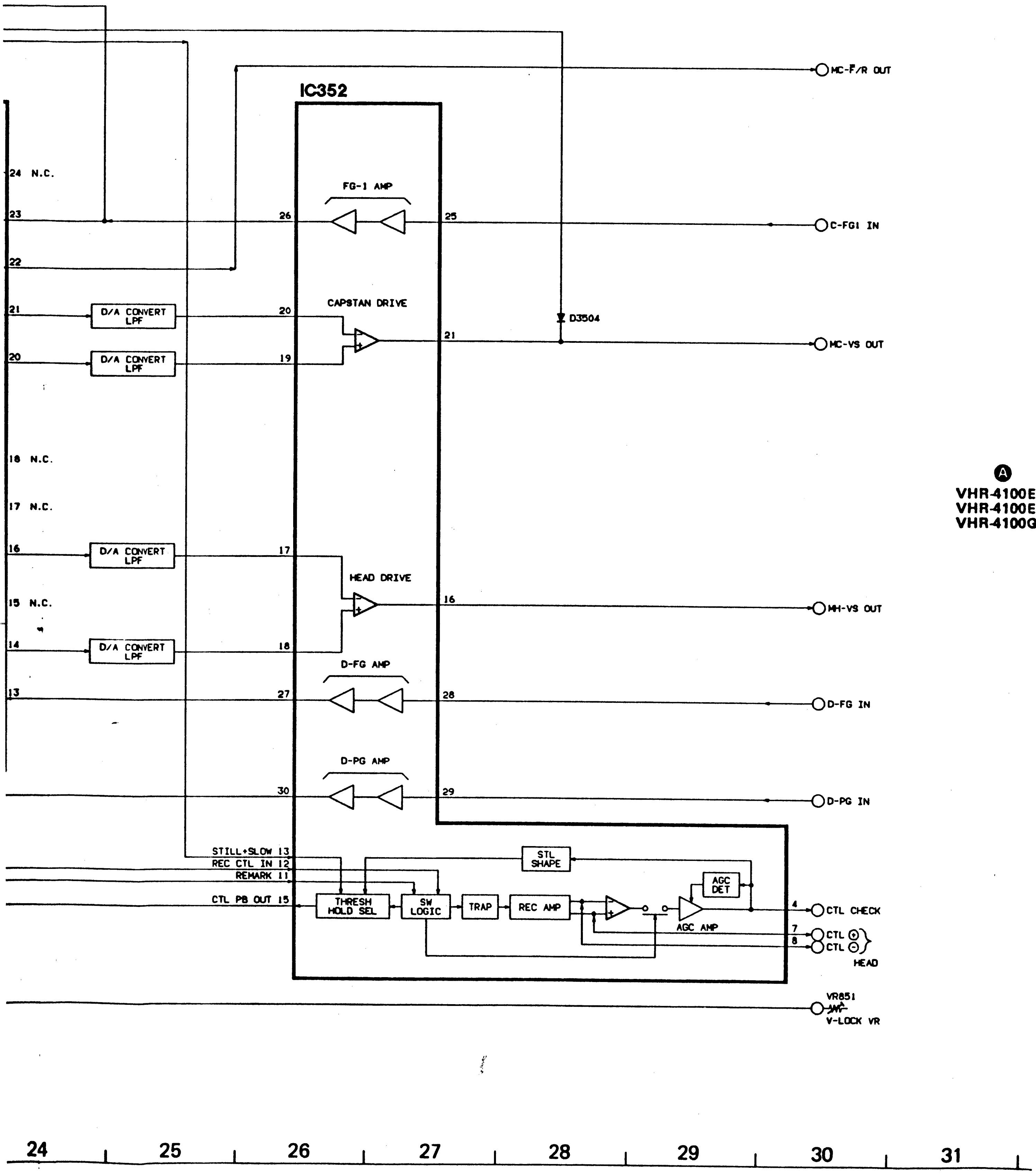
28

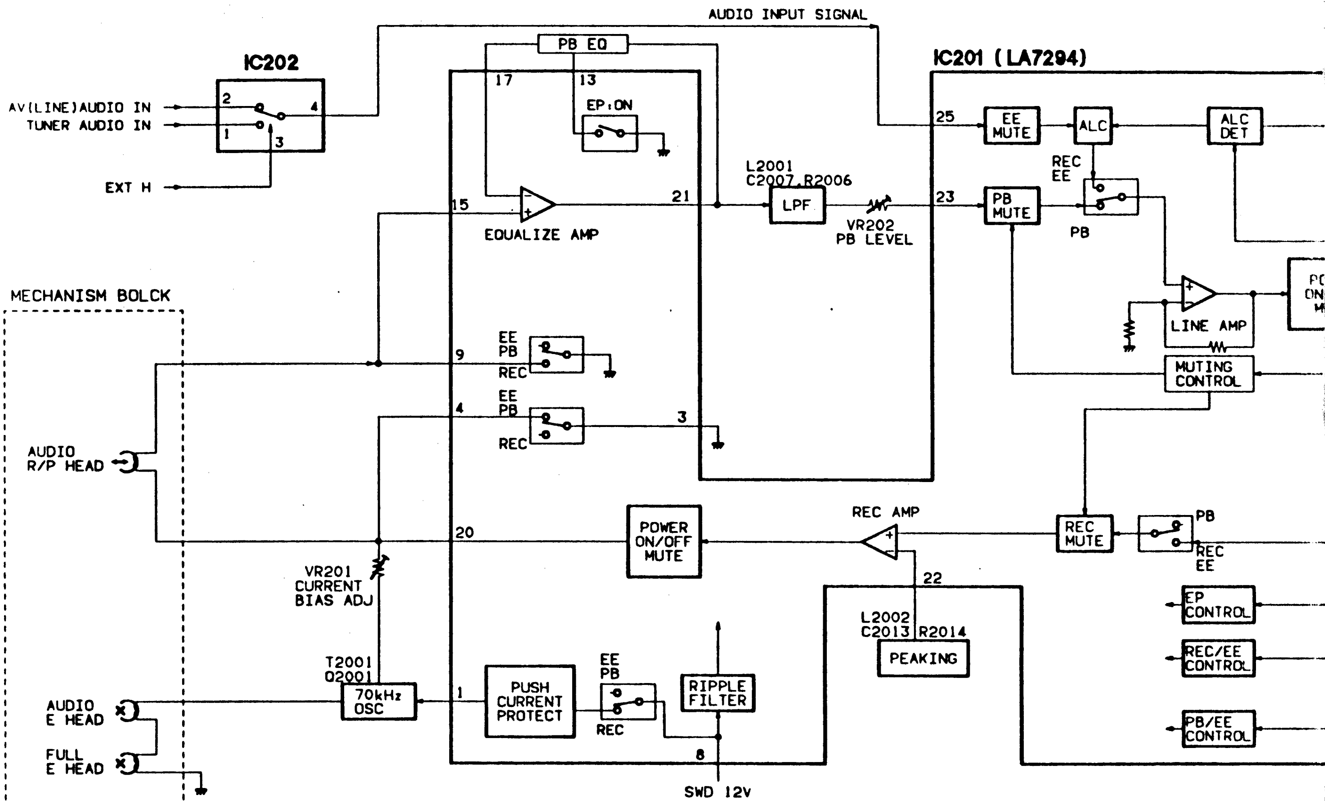
A


IC352
24 N.C.
23
22
21
20
18 N.C.
17 N.C.
16
15 N.C.
14
13
D/A CONVERT LPF
D/A CONVERT LPF
D/A CONVERT LPF
D/A CONVERT LPF
FG-1 AMP
26
25
CAPSTAN DRIVE
20
19
21
D3504
HEAD DRIVE
17
18
16
D-FG AMP
27
28
D-PG AMP
30
29
STILL+SLOW 13
REC CTL IN 12
REMARK 11
CTL PB OUT 15
THRESH HOLD SEL
SW LOGIC
TRAP
REC AMP
STL SHAPE
AGC DET
AGC AMP
4
7
8
MC-F/R OUT
C-FG1 IN
MC-VS OUT
MH-VS OUT
D-FG IN
D-PG IN
CTL CHECK
CTL ⊕
CTL ⊖
HEAD
VR851
V-LOCK VR
24
25
26
27
28
29
30
31

Ⓐ
VHR-4100EX
VHR-4100EV
VHR-4100G

B

AUDIO CIRCUIT BASIC BLOCK DIAGRAM


AUDIO INPUT SIGNAL
IC202
AV(LINE)AUDIO IN
TUNER AUDIO IN
EXT H
2
1
4
3
PB EQ
17
13
EP:ON
IC201 (LA7294)
25
EE MUTE
ALC
ALC DET
L2001
C2007,R2006
21
LPF
VR202
PB LEVEL
23
PB MUTE
REC
EE
PB
15
EQUALIZE AMP
LINE AMP
MUTING CONTROL
MECHANISM BOLCK
9
EE
PB
REC
4
EE
PB
REC
3
AUDIO
R/P HEAD
20
POWER ON/OFF MUTE
REC AMP
REC MUTE
PB
REC
EE
22
VR201
CURRENT
BIAS ADJ
L2002
C2013
R2014
PEAKING
EP CONTROL
REC/EE CONTROL
PB/EE CONTROL
T2001
Q2001
70kHz OSC
1
PUSH CURRENT PROTECT
EE
PB
REC
RIPPLE FILTER
8
SWD 12V
AUDIO
E HEAD
FULL
E HEAD

Ⓑ
VHR-4100EX
VHR-4100EV
VHR-4100G

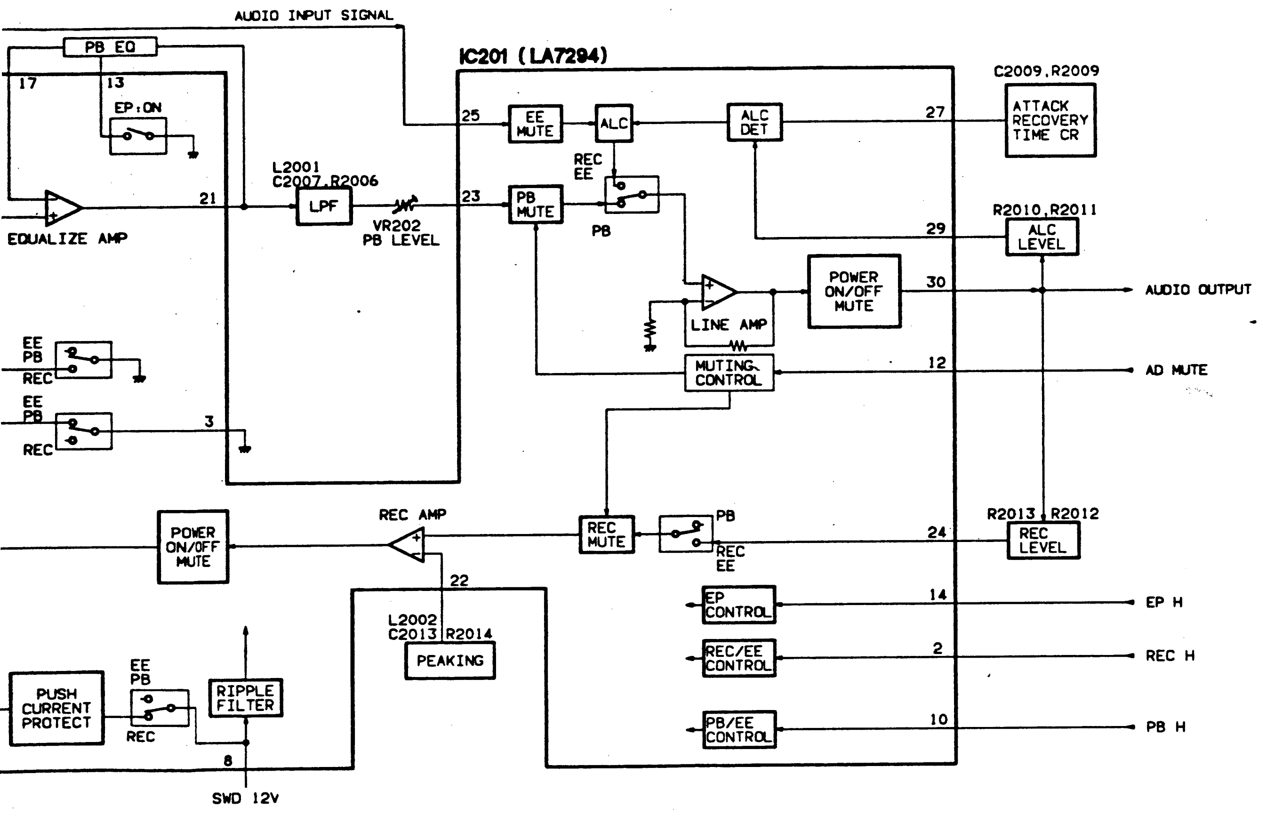
K
J
I
H
G
F
E
D
C
B
A

1 2 3 4 5 6 7 8

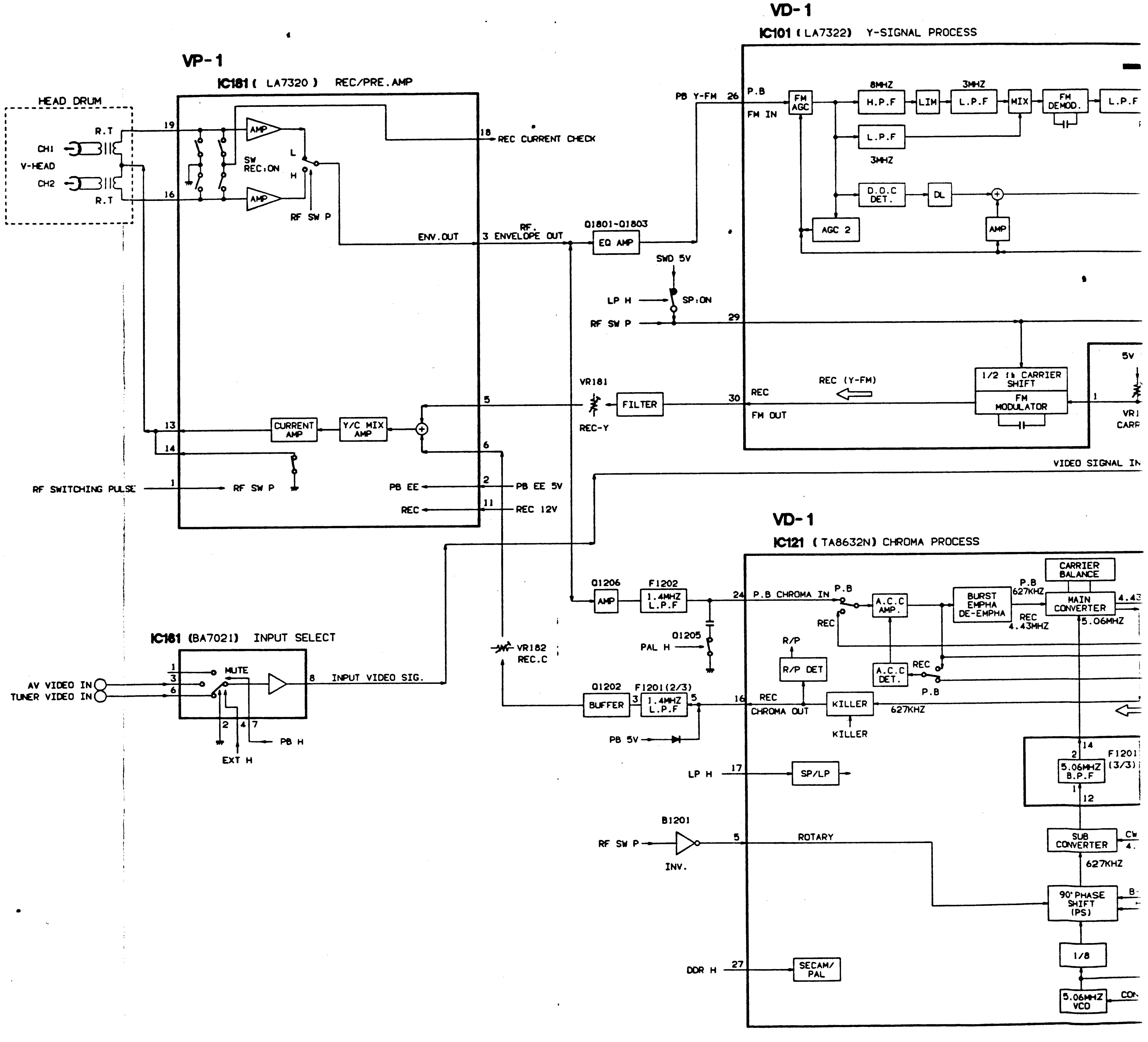
B

VIDEO CIRC

AUDIO CIRCUIT BASIC BLOCK DIAGRAM



AUDIO INPUT SIGNAL
PB EQ
17
13
EP:ON
EQUALIZE AMP
21
L2001
C2007,R2006
LPF
VR202
PB LEVEL
EE
PB
REC
EE
PB
REC
3
IC201 (LA7294)
25
EE MUTE
ALC
ALC DET
27
C2009,R2009
ATTACK RECOVERY TIME CR
REC
EE
23
PB MUTE
PB
29
R2010,R2011
ALC LEVEL
LINE AMP
POWER ON/OFF MUTE
30
AUDIO OUTPUT
12
MUTING CONTROL
AD MUTE
POWER ON/OFF MUTE
REC AMP
REC MUTE
PB
REC
EE
24
R2013
R2012
REC LEVEL
22
L2002
C2013
R2014
PEAKING
14
EP CONTROL
EP H
2
REC/EE CONTROL
REC H
10
PB/EE CONTROL
PB H
PUSH CURRENT PROTECT
EE
PB
REC
RIPPLE FILTER
8
SWD 12V

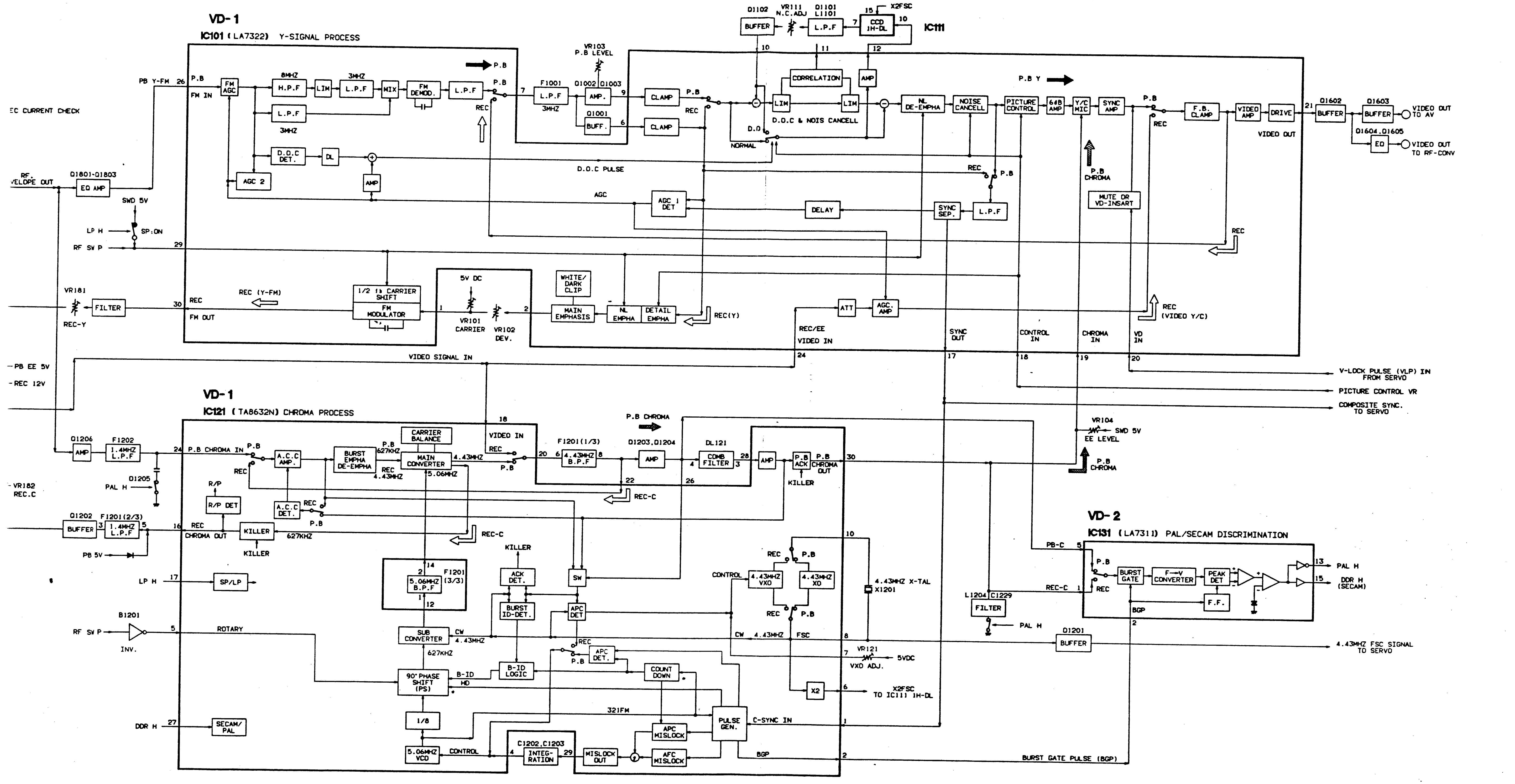


VP-1
IC181 (LA7320) REC/PRE.AMP
HEAD DRUM
R.T
CH1
V-HEAD
CH2
R.T
19
16
AMP
AMP
SW
REC:ON
L
H
RF SW P
18
REC CURRENT CHECK
ENV.OUT
3 ENVELOPE OUT
RF.
13
14
CURRENT AMP
Y/C MIX AMP
5
6
RF SWITCHING PULSE
1
RF SW P
PB EE
2
PB EE 5V
REC
11
REC 12V
IC161 (BA7021) INPUT SELECT
AV VIDEO IN
TUNER VIDEO IN
1
3
6
MUTE
8
INPUT VIDEO SIG.
2
4
7
PB H
EXT H
Q1801-Q1803
EQ AMP
SWD 5V
LP H
SP:ON
RF SW P
VR181
REC-Y
FILTER
VR182
REC.C
VD-1
IC101 (LA7322) Y-SIGNAL PROCESS
PB Y-FM
26
P.B
FM IN
FM AGC
8MHZ
H.P.F
LIM
3MHZ
L.P.F
MIX
FM DEMOD.
L.P.F
L.P.F
3MHZ
D.O.C DET.
DL
AGC 2
AMP
29
30
REC
FM OUT
REC (Y-FM)
1/2 fh CARRIER SHIFT
FM MODULATOR
1
5V
VR1
CARR
VIDEO SIGNAL IN
VD-1
IC121 (TA8632N) CHROMA PROCESS
Q1206
AMP
F1202
1.4MHZ L.P.F
24
P.B CHROMA IN
P.B
REC
A.C.C AMP.
BURST EMPHA DE-EMPHA
P.B
627KHZ
REC
4.43MHZ
CARRIER BALANCE
MAIN CONVERTER
4.43
5.06MHZ
Q1205
PAL H
R/P
R/P DET
A.C.C DET.
REC
P.B
Q1202
BUFFER
F1201(2/3)
3
1.4MHZ L.P.F
5
16
REC
CHROMA OUT
KILLER
627KHZ
KILLER
PB 5V
14
2
5.06MHZ B.P.F
1
12
F1201
(3/3)
LP H
17
SP/LP
B1201
RF SW P
INV.
5
ROTARY
SUB CONVERTER
627KHZ
90° PHASE SHIFT (PS)
1/8
5.06MHZ VCO
DDR H
27
SECAM/PAL

4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

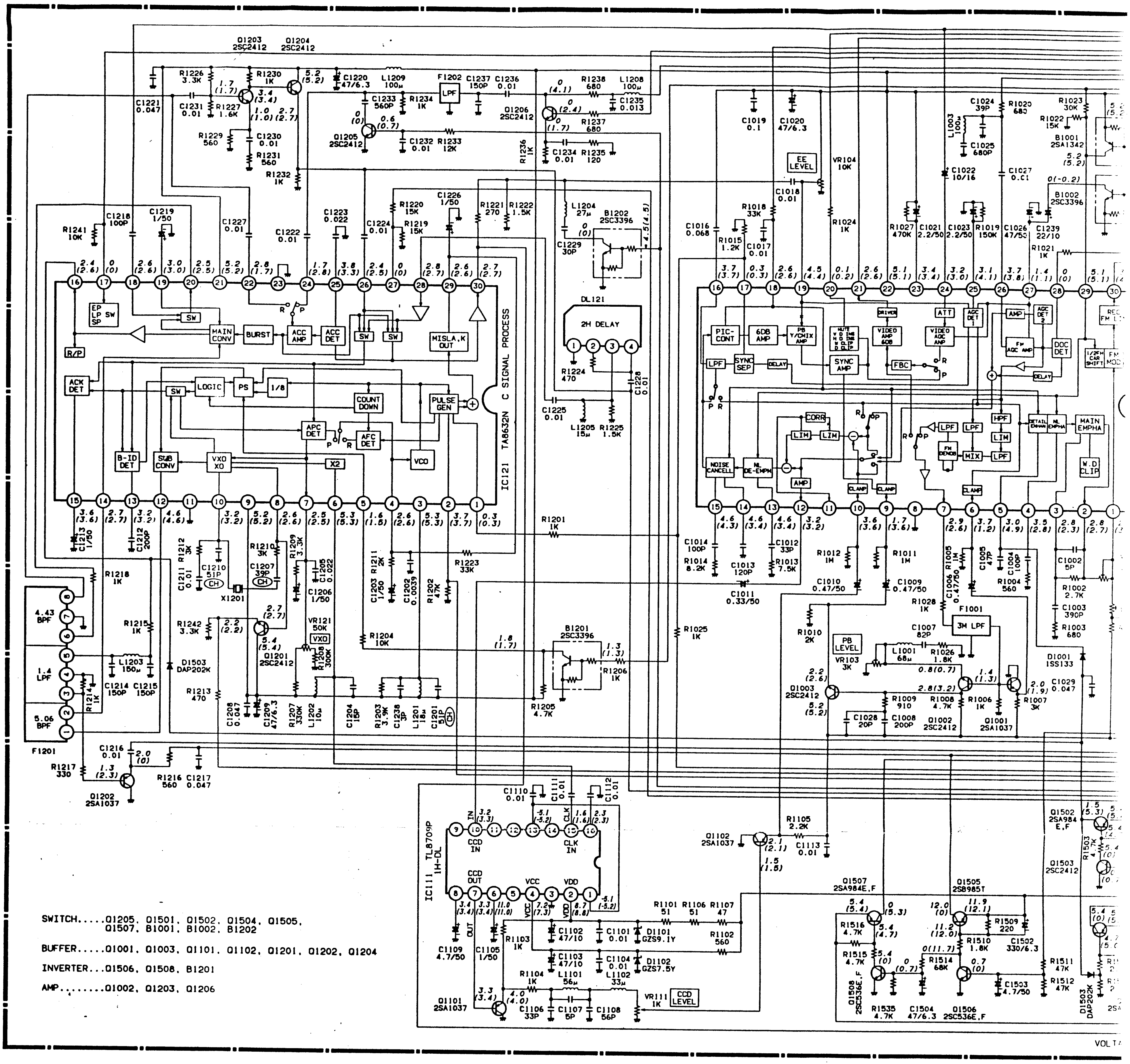
VIDEO CIRCUIT BASIC BLOCK DIAGRAM

3


VD-1
IC101 (LA7322) Y-SIGNAL PROCESS
PB Y-FM
P.B
FM IN
FM AGC
8MHZ H.P.F
LIM
3MHZ L.P.F
MIX
FM DEMOD.
L.P.F
3MHZ
D.O.C DET.
DL
AMP
AGC 2
P.B
REC
F1001 L.P.F 3MHZ
VR103 P.B LEVEL
Q1002 Q1003 AMP.
Q1001 BUFF.
CLAMP
CLAMP
D.O.C PULSE
AGC
AGC 1 DET
DELAY
Q1102 BUFFER
VR111 N.C.ADJ
Q1101 L1101 L.P.F
CCD 1H-DL
X2FSC
IC111
CORRELATION
AMP
LIM
LIM
D.O.C & NOIS CANCELL
NORMAL
D.O
NL DE-EMPHA
NOISE CANCELL
PICTURE CONTROL
6dB AMP
Y/C MIC
SYNC AMP
P.B Y
F.B. CLAMP
VIDEO AMP
DRIVE
VIDEO OUT
SYNC SEP.
L.P.F
P.B CHROMA
MUTE OR VD-INSART
REC
Q1602 BUFFER
Q1603 BUFFER
VIDEO OUT TO AV
Q1604.Q1605 EQ
VIDEO OUT TO RF-CONV
EC CURRENT CHECK
RF. VELOPE OUT
Q1801-Q1803 EQ AMP
SWD 5V
LP H
SP:ON
RF SW P
VR181
FILTER
REC-Y
REC (Y-FM)
FM OUT
1/2 fh CARRIER SHIFT
FM MODULATOR
5V DC
VR101 CARRIER
VR102 DEV.
WHITE/ DARK CLIP
MAIN EMPHASIS
NL EMPHA
DETAIL EMPHA
REC(Y)
ATT
AGC. AMP
REC (VIDEO Y/C)
REC/EE VIDEO IN
SYNC OUT
CONTROL IN
CHROMA IN
VD IN
PB EE 5V
REC 12V
VIDEO SIGNAL IN
V-LOCK PULSE (VLP) IN FROM SERVO
PICTURE CONTROL VR
COMPOSITE SYNC. TO SERVO
VD-1
IC121 (TA8632N) CHROMA PROCESS
Q1206 AMP
F1202 1.4MHZ L.P.F
P.B CHROMA IN
Q1205 PAL H
VR182 REC.C
A.C.C AMP.
BURST EMPHA DE-EMPHA
CARRIER BALANCE
MAIN CONVERTER
627KHZ
4.43MHZ
5.06MHZ
VIDEO IN
R/P
R/P DET
A.C.C DET.
Q1202 BUFFER
F1201(2/3) 1.4MHZ L.P.F
REC CHROMA OUT
KILLER
PB 5V
REC-C
P.B CHROMA
F1201(1/3) 4.43MHZ B.P.F
Q1203.Q1204 AMP
DL121 COMB FILTER
AMP
P.B ACK
P.B CHROMA OUT
KILLER
REC-C
VR104 SWD 5V EE LEVEL
P.B CHROMA
SP/LP
5.06MHZ B.P.F
F1201 (3/3)
ACK DET.
BURST ID-DET.
SW
APC DET
CONTROL
4.43MHZ VXO
4.43MHZ XO
4.43MHZ X-TAL X1201
B1201 INV.
RF SW P
ROTARY
SUB CONVERTER
CW 4.43MHZ
627KHZ
90° PHASE SHIFT (PS)
B-ID
HD
B-ID LOGIC
APC DET.
COUNT DOWN
CW 4.43MHZ FSC
VR121 VXO ADJ. 5VDC
X2
X2FSC TO IC111 1H-DL
DDR H
SECAM/ PAL
1/8
321FM
PULSE GEN.
C-SYNC IN
APC MISLOCK
5.06MHZ VCO
CONTROL
C1202.C1203 INTEG-RATION
MISLOCK OUT
AFC MISLOCK
BGP
BURST GATE PULSE (BGP)
VD-2
IC131 (LA7311) PAL/SECAM DISCRIMINATION
PB-C
REC-C
BURST GATE
F→V CONVERTER
PEAK DET
F.F.
PAL H
DDR H (SECAM)
L1204 C1229 FILTER
PAL H
Q1201 BUFFER
4.43MHZ FSC SIGNAL TO SERVO

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32

COMPL. VD-1 VIDEO CIRCUIT (1AC-0-B11A-00800)


IC121 TA8632N C SIGNAL PROCESS
IC111 TL870HP 1H-DL
DL121 2H DELAY
F1201
VOLTAGE

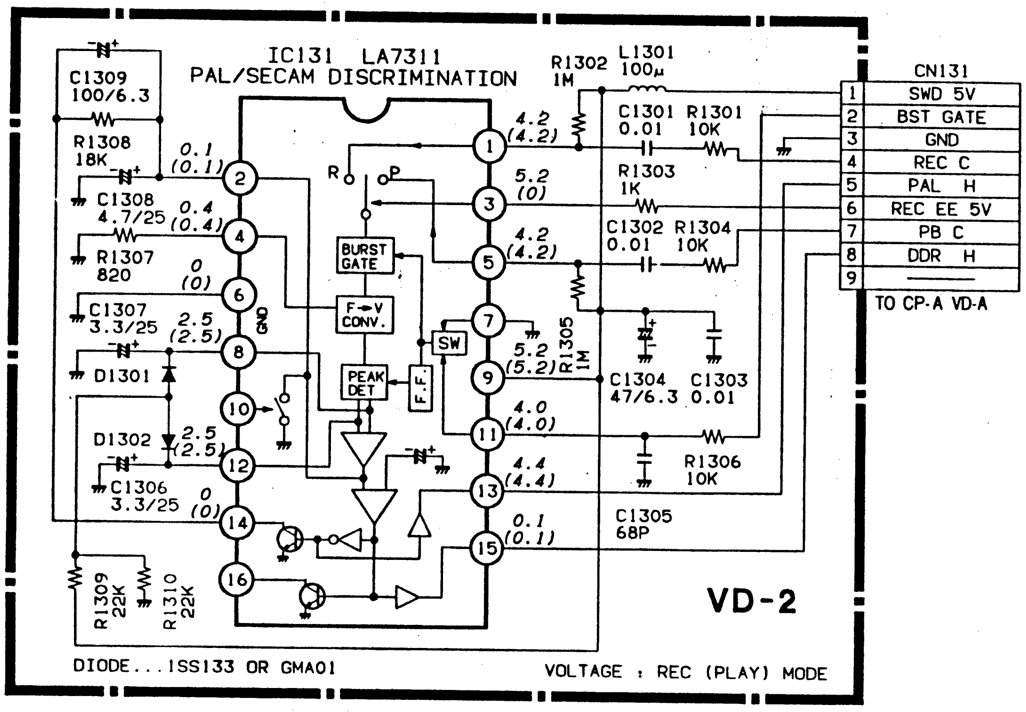
SWITCH.....Q1205, Q1501, Q1502, Q1504, Q1505, Q1507, B1001, B1002, B1202

BUFFER.....Q1001, Q1003, Q1101, Q1102, Q1201, Q1202, Q1204

INVERTER...Q1506, Q1508, B1201

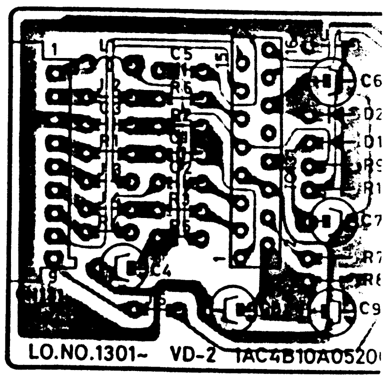
AMP........Q1002, Q1203, Q1206

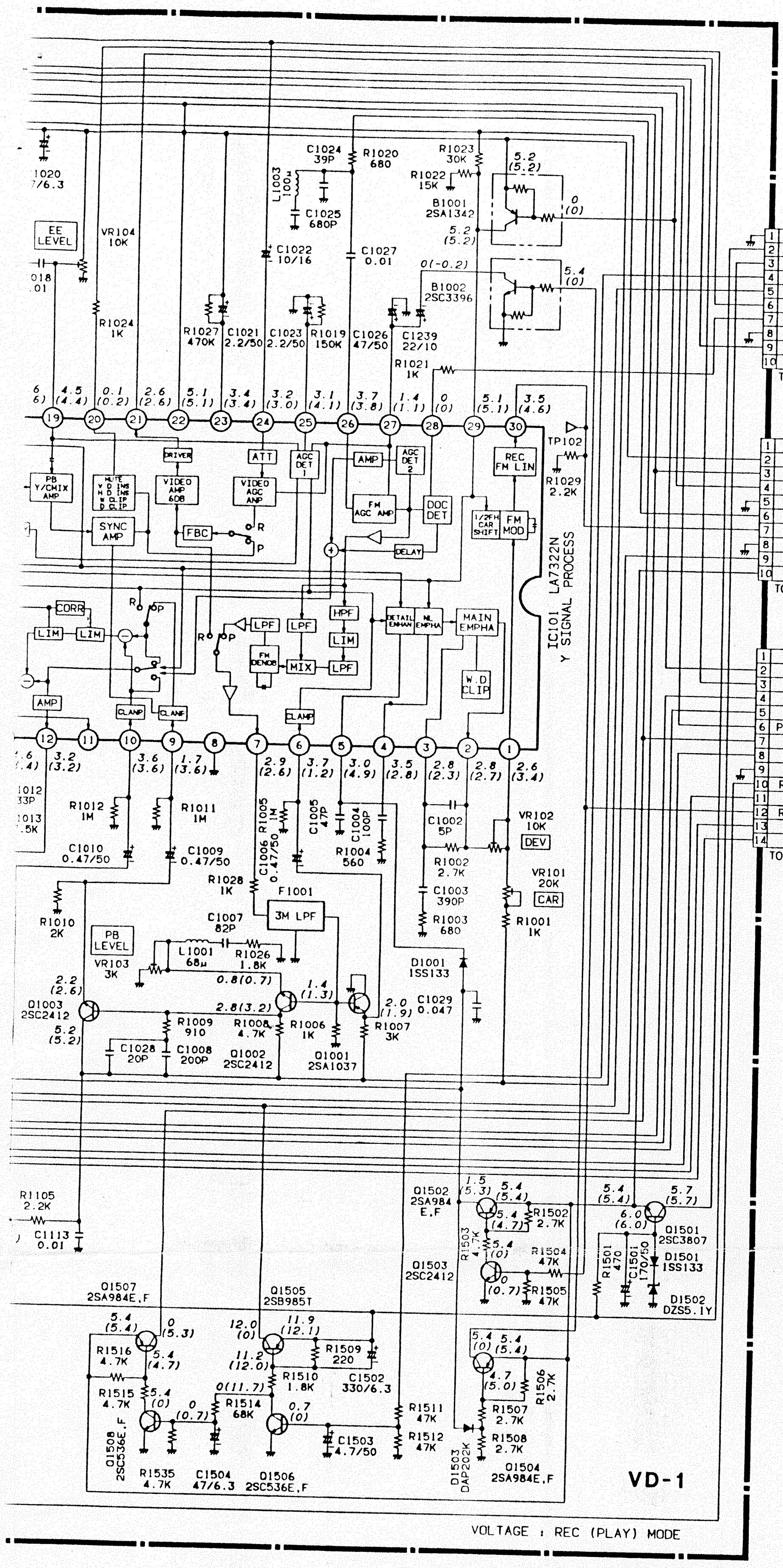
COMPL. VD-2 VIDEO CIRCUIT & P.C.B. (1AC-0-B10A-05200)

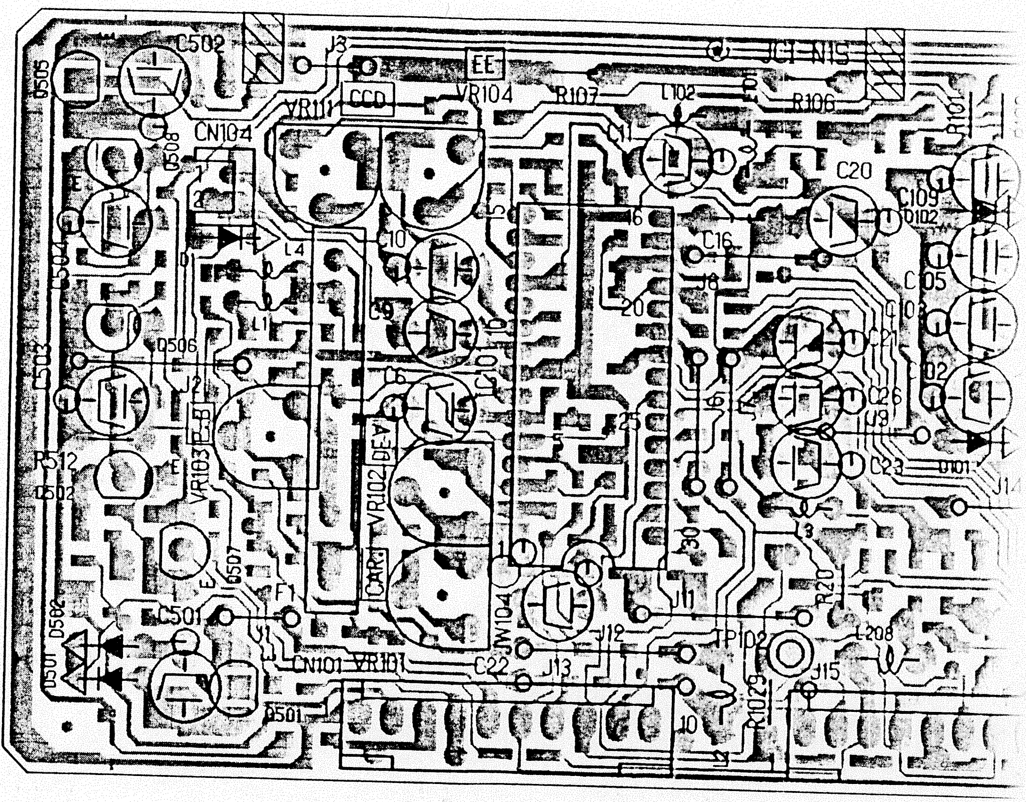

IC131 LA7311
PAL/SECAM DISCRIMINATION
CN131
1 SWD 5V
2 BST GATE
3 GND
4 REC C
5 PAL H
6 REC EE 5V
7 PB C
8 DDR H
9
TO CP-A VD-A
VD-2

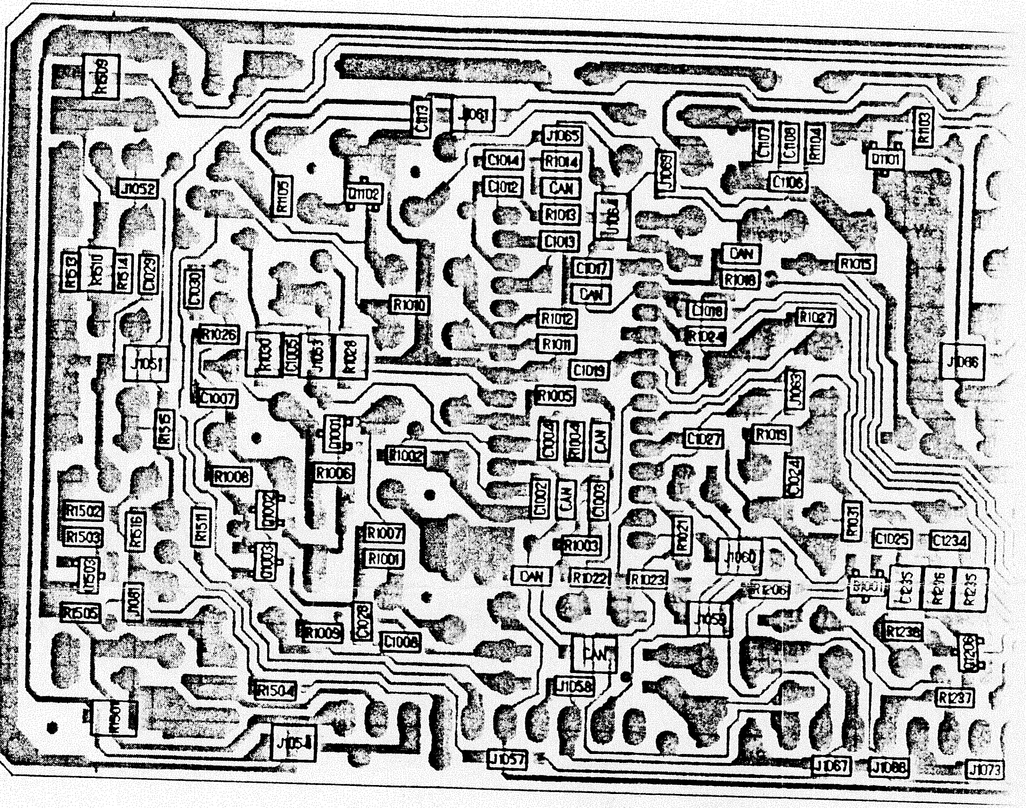
DIODE...1SS133 OR GMA01

VOLTAGE : REC (PLAY) MODE

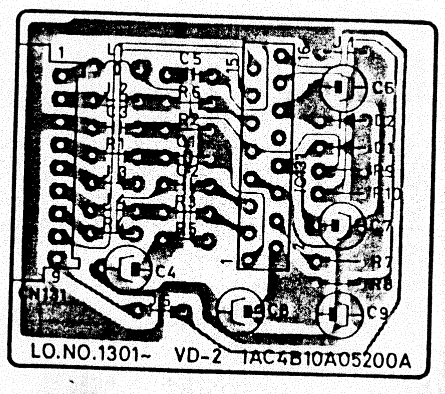

LO.NO.1301~ VD-2 1AC4B10A0520

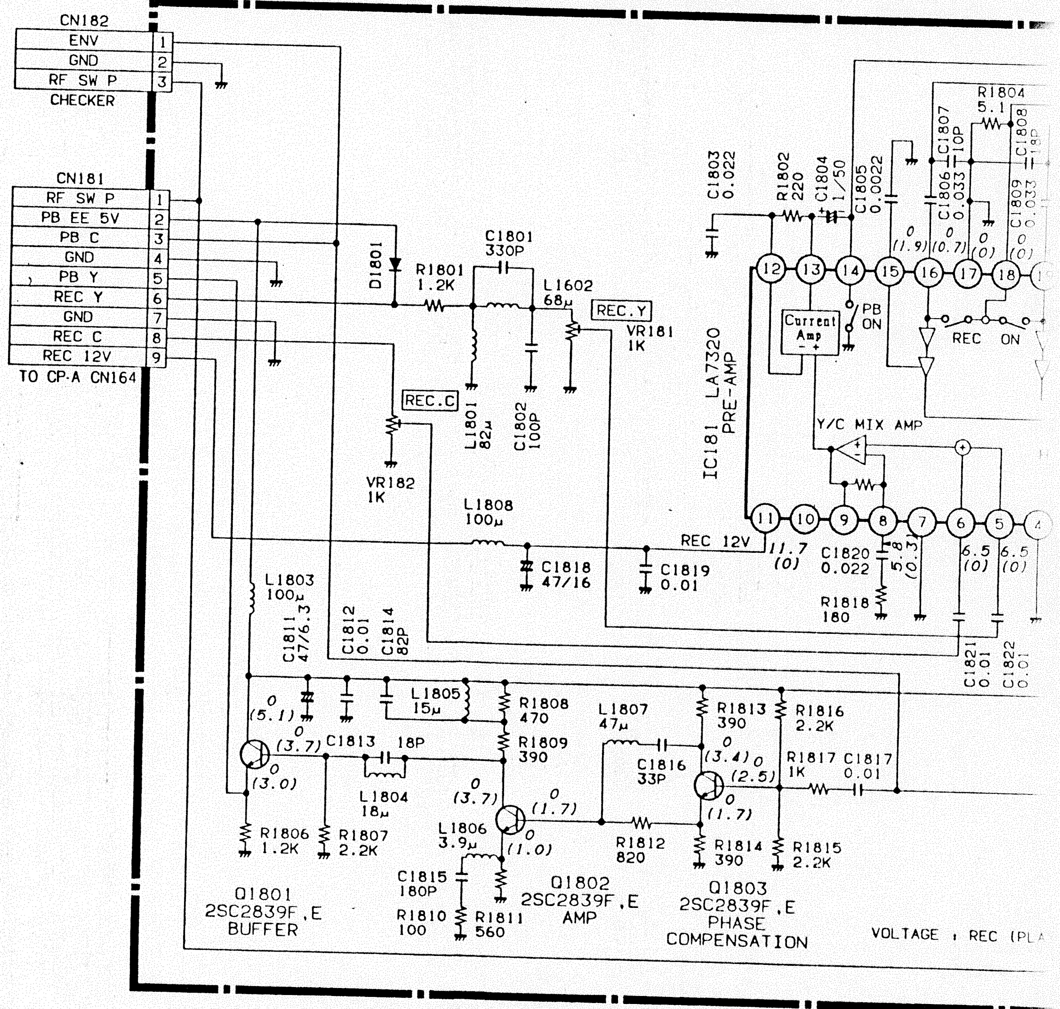

CN101
1 GND
2 ALWAYS 5.8V
3 SWD 12V
4 PB H
5 REC H
6 VD IN
7 DOP
8 GND
9 VD OUT
10
TO CP-A VD-A
CN102
1 RF SW P
2 PB EE 5V
3 PB C
4 GND
5 PB Y
6 REC Y
7 GND
8 REC C
9 REC 12V
TO CP-A VD-A
CN103
1 LP H
2 VLP
3 C SYNC
4 FSC
5 PICTURE VR
6 SWD 5V
7 BST GATE
8 GND
9 REC C OUT
10 PAL H
11 REC EE 5V
12 PB C
13 DDR H
14
TO CP-A VD-A
IC101 LA7322N Y SIGNAL PROCESS
EE LEVEL
PB LEVEL
VR101 20K CAR
VR102 10K DEV
VR103 3K
VR104 10K
F1001 3M LPF
Q1001 2SA1037
Q1002 2SC2412
Q1003 2SC2412
B1001 2SA1342
B1002 2SC3396
D1001 1SS133
Q1501 2SC3807
Q1502 2SA984 E,F
Q1503 2SC2412
Q1504 2SA984E,F
Q1505 2SB985T
Q1506 2SC536E,F
Q1507 2SA984E,F
Q1508 2SC536E,F
D1501 1SS133
D1502 DZS5.1Y
D1503 DAP202K
VD-1
VOLTAGE : REC (PLAY) MODE


C502
CN104
VR111
VR104
R107
L102
R106
C20
VR103
VR102
CAR
DEV
C501
CN101
VR101
TP102
R1029

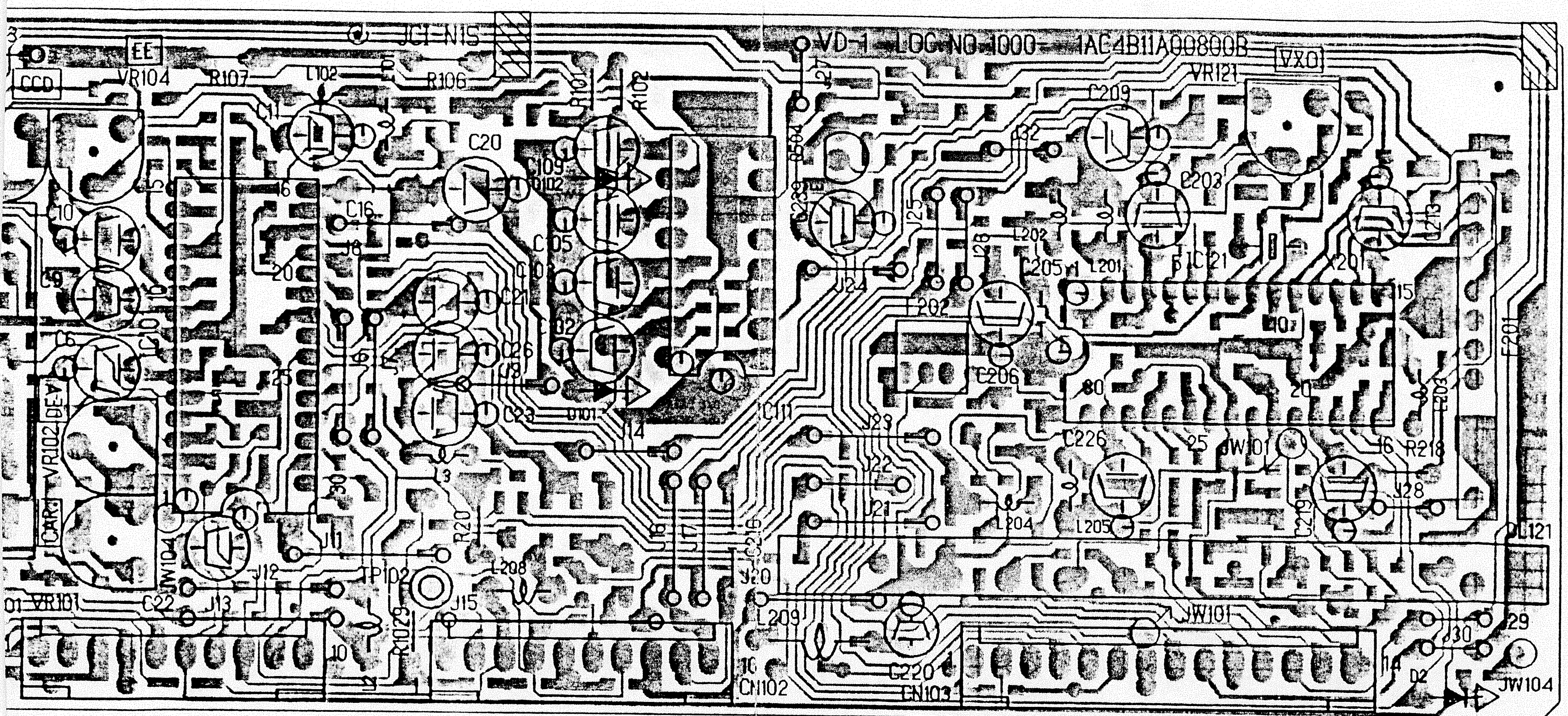


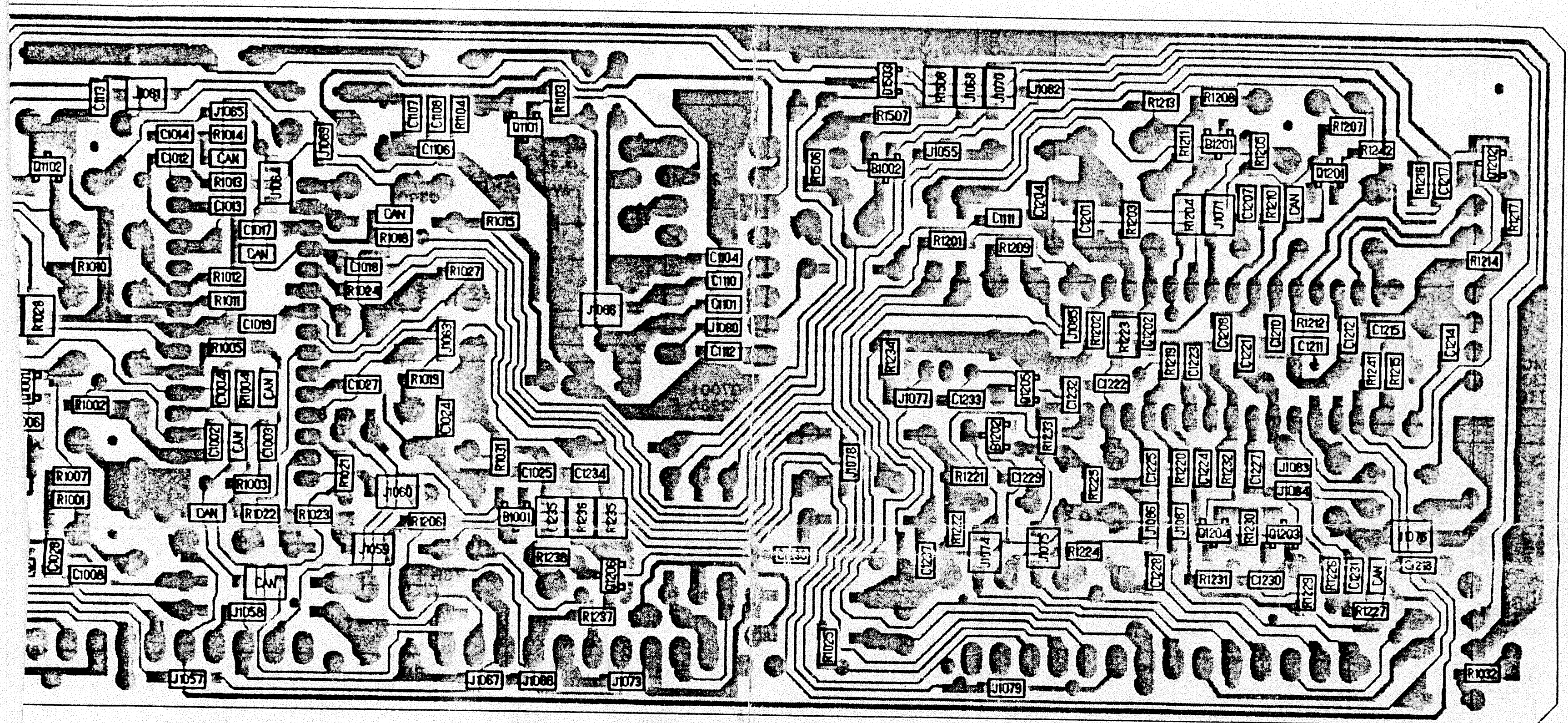
COMPL. VP-1 VIDEO PRE-AMP CIRCUIT (1AC-0-B10A


LO.NO.1301~ VD-2 1AC4B10A05200A
CN131


CN182
ENV
GND
RF SW P
CHECKER
CN181
RF SW P
PB EE 5V
PB C
GND
PB Y
REC Y
GND
REC C
REC 12V
TO CP-A CN164
IC181 LA7320 PRE-AMP
REC.Y
REC.C
VR181 1K
VR182 1K
Current Amp
Y/C MIX AMP
REC 12V
PB
ON
REC ON
Q1801 2SC2839F,E BUFFER
Q1802 2SC2839F,E AMP
Q1803 2SC2839F,E PHASE COMPENSATION
VOLTAGE : REC (PLA

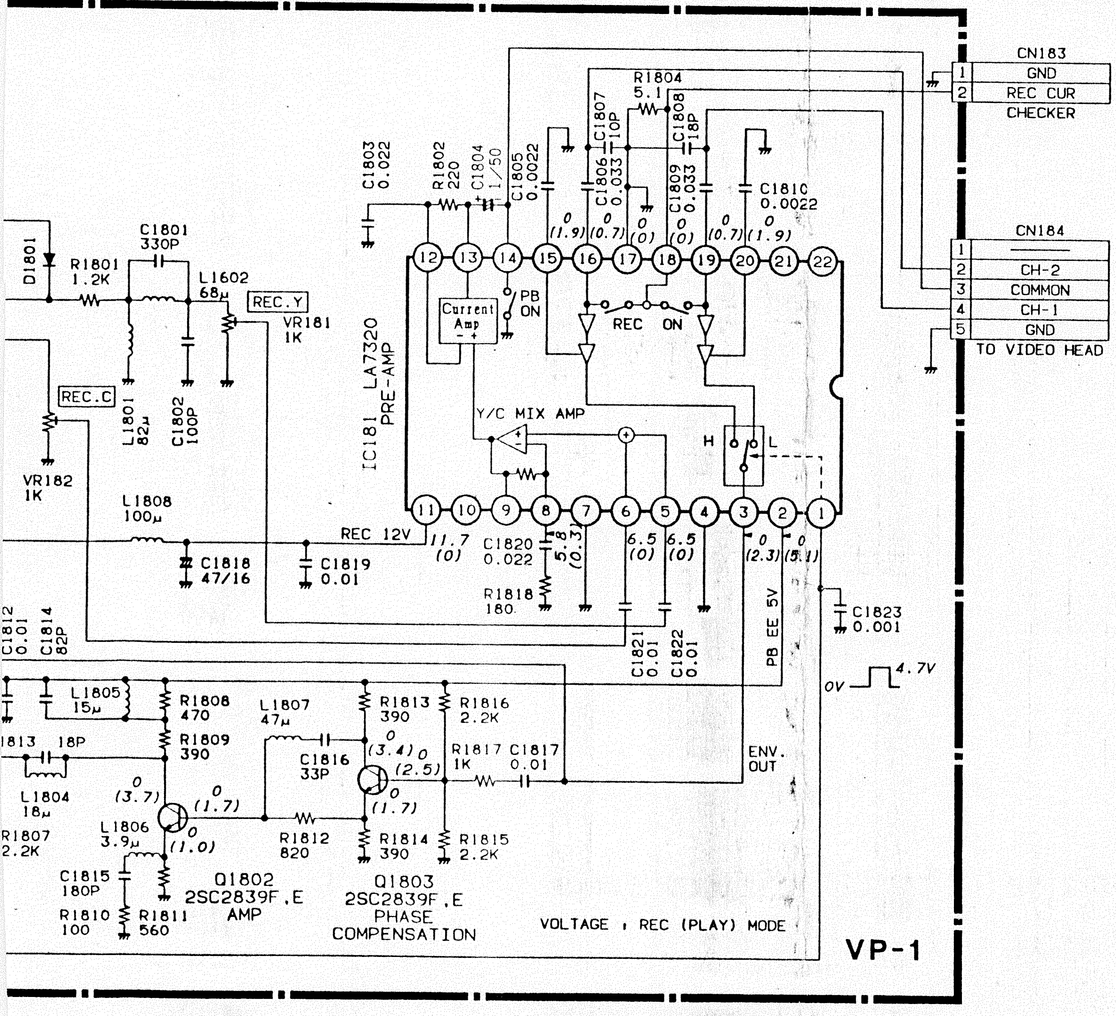
VD-1 VIDEO P.C.B.


VD-1 LOC NO 1000 1AC4B11A00800B
VXO
CCD
EE
VR104
R107
L102
R106
C11
C20
C16
C205
L201
C203
C209
VR121
X201
C206
L202
IC111
C226
JW101
R218
L204
L205
C219
C220
CN103
CN102
L209
JW104
D2
TP102
VR101
C22
J15
VR102
F201

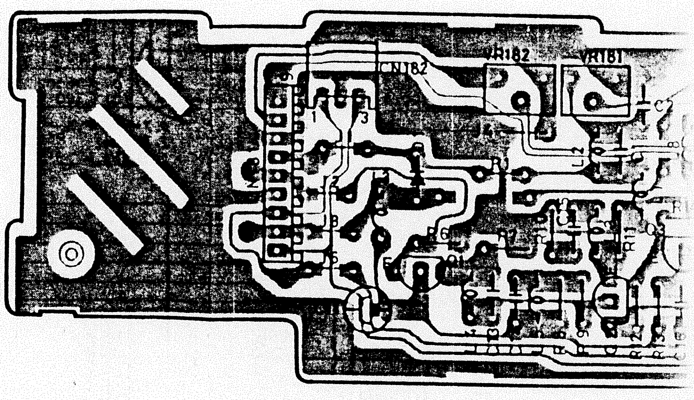

J1061
C1014
R1014
C1012
R1003
C1013
C1017
R1010
R1012
R1011
C1019
R1005
R1007
R1001
R1003
R1022
R1023
C1106
Q1101
R1015
R1016
R1017
C1104
C1110
Q1101
J1080
C1112
R1027
R1019
C1025
C1234
J1060
R1206
B1001
R1236
R1237
J1067
J1088
J1073
J1057
J1058
J1503
R1507
J1055
B1002
R1201
R1209
C1111
C1233
R1221
C1223
R1224
J1074
J1079
R1218
R1208
B1201
Q1201
R1207
R1214
R1212
C1211
C1215
J1083
J1084
R1231
C1230
R1227
Q1218
R1032

CHIP PARTS

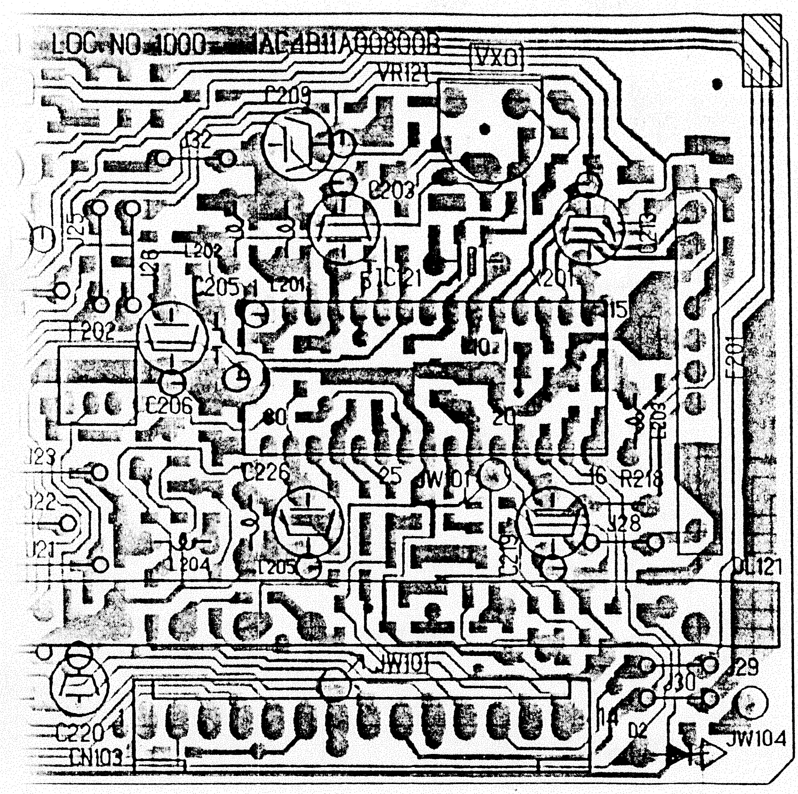
PL. VP-1 VIDEO PRE-AMP CIRCUIT (1AC-0-B10A-02200)


CN183
GND
REC CUR CHECKER
CN184
CH-2
COMMON
CH-1
GND
TO VIDEO HEAD
R1804 5.1
C1807 10P
C1808 18P
C1803 0.022
R1802 220
C1804 1/50
C1805 0.0022
C1806 0.033
C1809 0.033
C1810 0.0022
C1801 330P
D1801
R1801 1.2K
L1602 68μ
REC.Y
VR181 1K
REC.C
VR182 1K
L1801 82μ
C1802 100P
L1808 100μ
C1818 47/16
C1819 0.01
REC 12V
IC181 LA7320 PRE-AMP
Current Amp
PB ON
REC ON
Y/C MIX AMP
H
L
C1820 0.022
R1818 180
C1821 0.01
C1822 0.01
PB EE 5V
C1823 0.001
0V
4.7V
C1812 0.01
C1814 82P
L1805 15μ
R1808 470
R1809 390
L1807 47μ
R1813 390
R1816 2.2K
R1817 1K
C1817 0.01
C1816 33P
ENV. OUT
C1813 18P
L1804 18μ
L1806 3.9μ
R1807 2.2K
R1812 820
R1814 390
R1815 2.2K
C1815 180P
R1810 100
R1811 560
Q1802 2SC2839F,E AMP
Q1803 2SC2839F,E PHASE COMPENSATION
VOLTAGE : REC (PLAY) MODE
VP-1

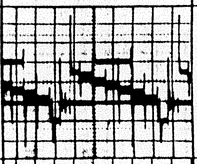
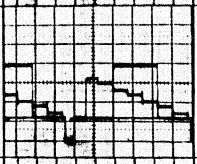
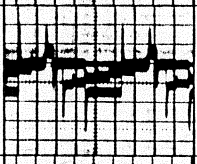
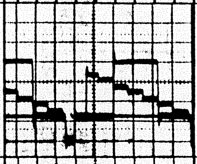
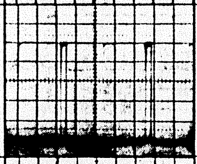
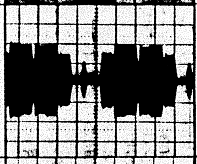
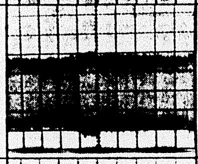
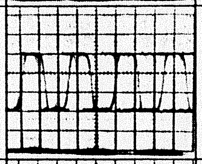
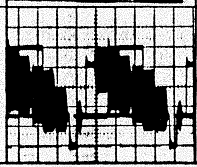
VP-1 VID

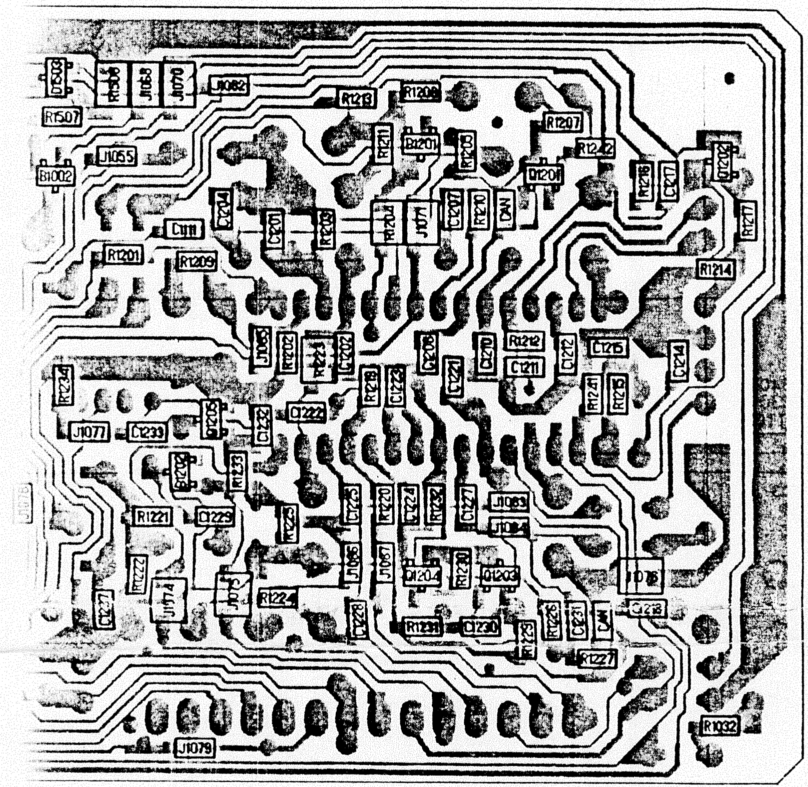

CN182
VR182
VR181

16 17 18 19 20 21 22 23 24 25 26

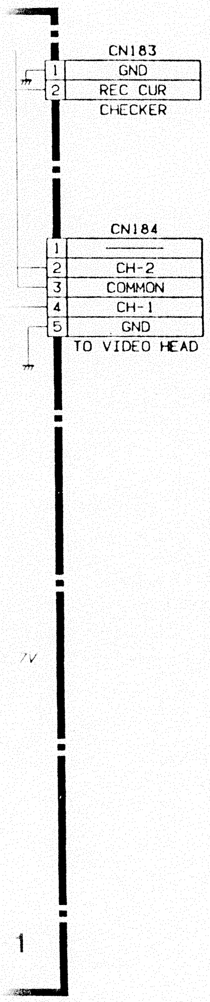

LOC NO 1000
AC4B11A00800B
VXO
VR121
C209
C203
L202
C205
L201
IC121
X201
15
T202
C206
30
20
C226
25
16
R218
L204
L205
C121
JW101
J30
29
C220
CN103
D2
JW104
F201

WAVEFORM OF VIDEO

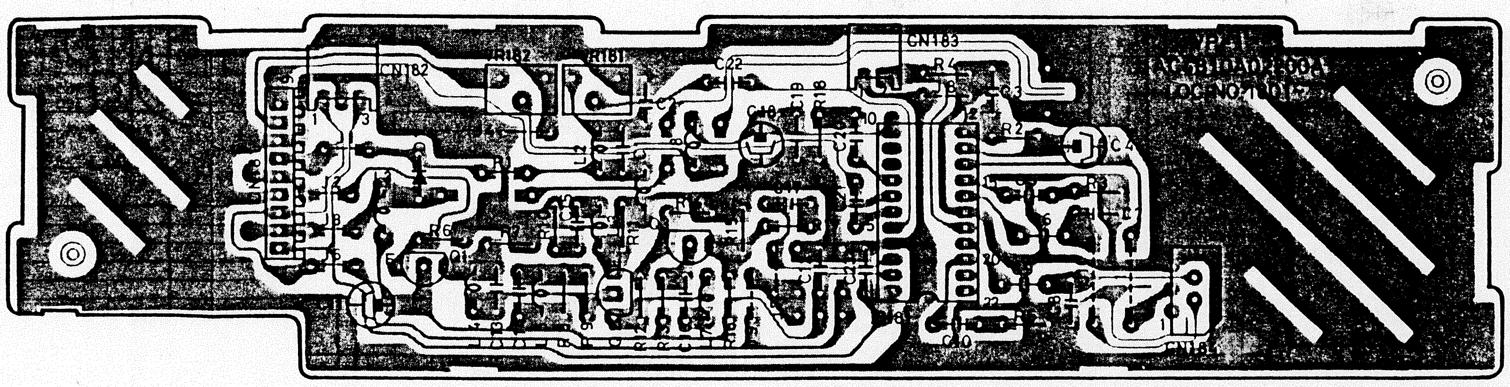
Pin No.		
IC101 (2)		REC 1.2 Vp-p (200 mV/div)
(6)		REC 500 m Vp-p (100 mV/div)
(6)		PLAY 300 m Vp-p (100 mV/div)
(9) (10)		PLAY 500 m Vp-p (100 mV/div)
(17)		4 Vp-p 15.625 KHz (1 V/div)
(18)		PLAY 320 m Vp-p (100 mV/div)
(26)		PLAY 400 m Vp-p (100 mV/div)
(30)		REC 1.5 Vp-p (500 mV/div)
TP161 (CP-1)		PLAY 1 Vp-p (200 mV/div)


R1507
B1002
J1055
R1201
R1209
R1208
R1207
R1206
R1214
R1212
R1221
R1224
R1227
R1231
R1232
J1077
J1079
J1082
J1083
J1084
R1032

CHIP PARTS


CN183
1
GND
2
REC CUR
CHECKER
CN184
1
2
CH-2
3
COMMON
4
CH-1
5
GND
TO VIDEO HEAD
1

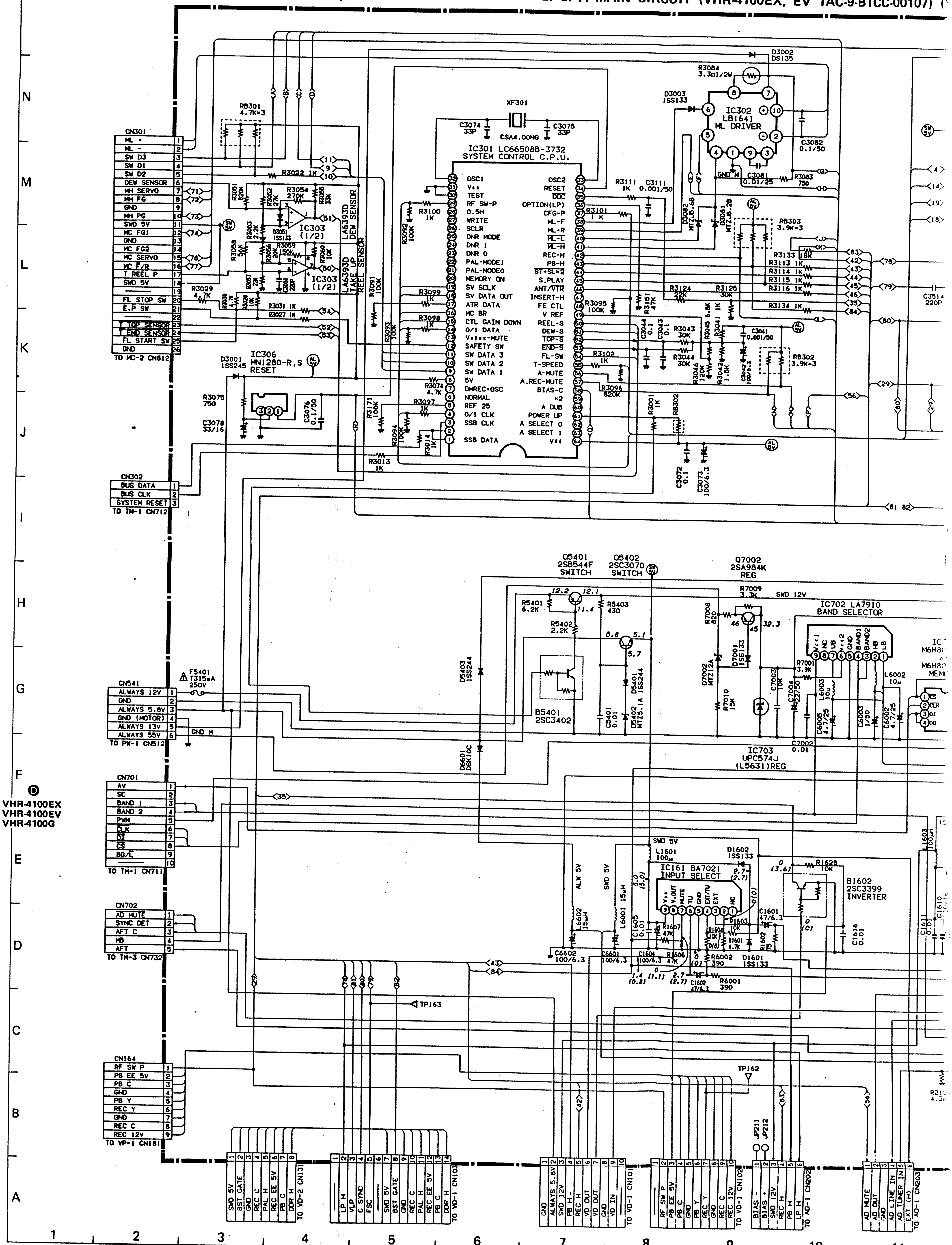
VP-1 VIDEO PRE-AMP P.C.B.


CN182
R182
R181
C22
CN183
VP-1
C18
C19
R18
R2
C4
CN184

21 22 23 24 25 26 27 28 29 30 31

D

COMPL. CP-A MAIN CIRCUIT (VHR-4100EX, EV 1AC-9-B1CC-00107)

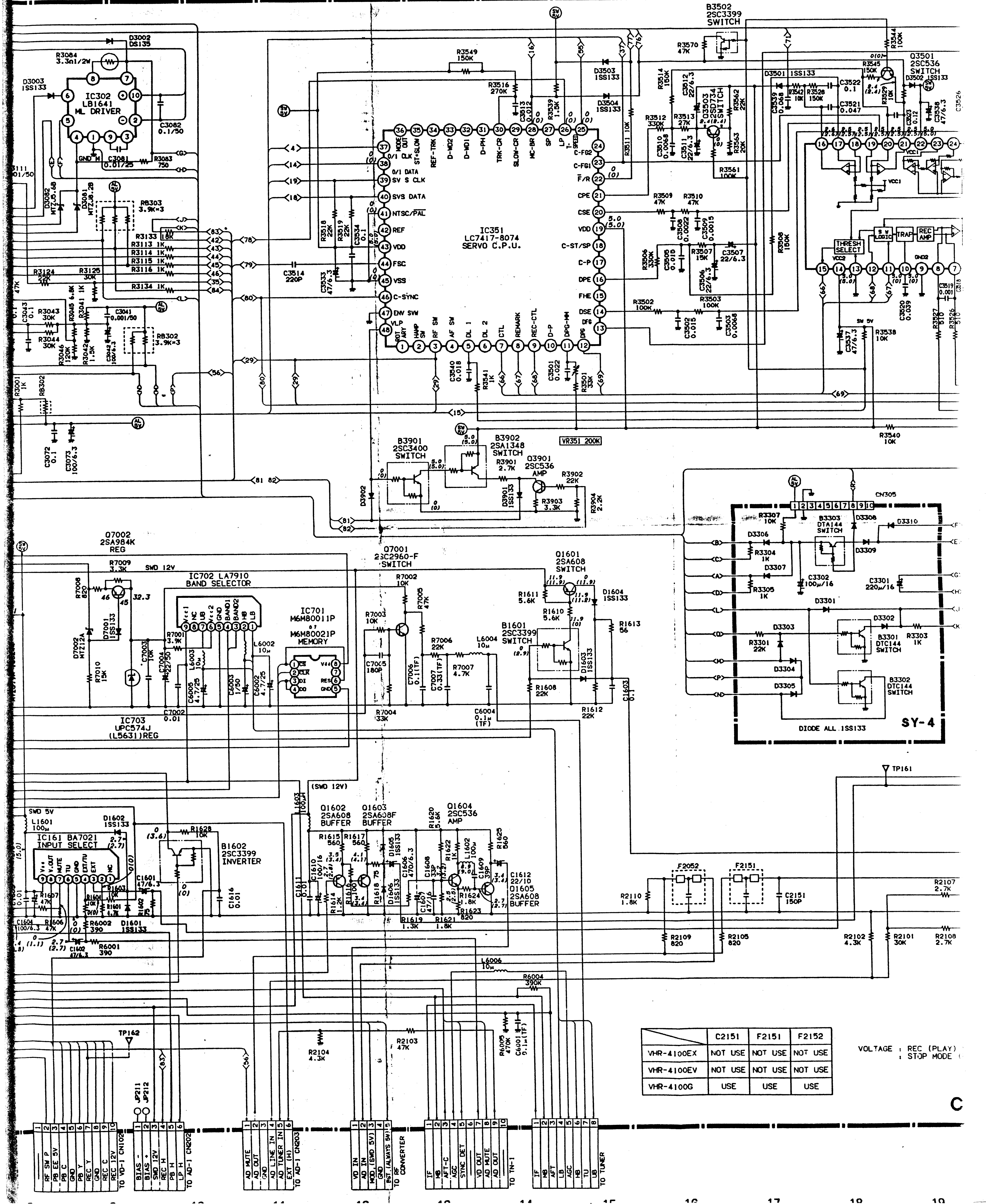


N
M
L
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
CN301
ML +
ML -
SW D3
SW D1
SW D2
DEW SENSOR
MH SERVO
MH FG
GND
MH PG
SWD 5V
MC FG1
GND
MC FG2
MC SERVO
MC F/R
T REEL P
SWD 5V
FL STOP SW
E.P SW
TOP SENSOR
END SENSOR
FL START SW
GND
TO MC-2 CN812
R8301 4.7K×3
R3022 1K
IC303 (1/2)
IC303 (1/2)
LA6393D DEW SENSOR
LA6393D TAKE UP REEL SENSOR
R3029 4.7K
R3031 1K
R3027 1K
IC306 MN1280-R.S RESET
D3001 1SS245
R3075 750
C3078 33/16
C3076 0.1/50
XF301
C3074 33P
C3075 33P
CSA4.00MG
IC301 LC66508B-3732
SYSTEM CONTROL C.P.U.
OSC1
TEST
RF SW-P
0.5H
WRITE
SCLR
DNR MODE
DNR 1
DNR 0
PAL-MODE1
PAL-MODE0
MEMORY ON
SV SCLK
SV DATA OUT
ATR DATA
MC BR
CTL GAIN DOWN
0/1 DATA
SAFETY SW
SW DATA 3
SW DATA 2
SW DATA 1
5V
DMREC+OSC
NORMAL
REF 25
0/1 CLK
SSB CLK
SSB DATA
OSC2
RESET
DOC
OPTION(LP)
CFG-P
ML-F
ML-R
ML-L
ML-H
REC-H
PB-H
ST+SL×2
S.PLAY
ANT/VTR
INSERT-H
FE CTL
V REF
REEL-S
DEW-S
TOP-S
END-S
FL-SW
T-SPEED
A-MUTE
A.REC-MUTE
BIAS-C
A DUB
POWER UP
A SELECT 0
A SELECT 1
R3084 3.3Ω1/2W
D3002 DS135
D3003 1SS133
IC302 LB1641 ML DRIVER
C3082 0.1/50
C3081 0.01/25
R3083 750
R3111 1K
C3111 0.001/50
R3101 1K
D3082 MTZJ5.6B
D3081 MTZJ6.2B
R8303 3.9K×3
R3133 18K
R3113 1K
R3114 1K
R3115 1K
R3116 1K
R3134 1K
R3124 22K
R3125 30K
R3095 100K
R3151 47K
R3043 30K
R3044 30K
R3041 1K
R3045 6.8K
R3046 120K
R3042 1.5K
C3041 0.001/50
C3042 100/6.3
R8302 3.9K×3
R3102 1K
R3096 820K
R3001 1K
C3072 0.1
C3073 100/6.3
C3514 220P
CN302
BUS DATA
BUS CLK
SYSTEM RESET
TO TM-1 CN712
Q5401 2SB544F SWITCH
Q5402 2SC3070 SWITCH
R5401 6.2K
R5403 430
R5402 2.2K
B5401 2SC3402
D5403 1SS244
D5401 1SS244
D5402 MTZ5.1A
C5401 0.01
D6601 DSK10C
Q7002 2SA984K REG
R7009 3.3K
SWD 12V
R7008 820
D7002 MTZ12A
D7001 1SS133
R7010 15K
C7003 10K
C7004 22/50
C7002 0.01
IC703 UPC574J (L5631)REG
IC702 LA7910 BAND SELECTOR
R7001 3.9K
L6003 10μ
L6002 10μ
C6005 4.7/25
C6003 1/50
C6002 4.7/25
CN541
ALWAYS 12V
GND
ALWAYS 5.8V
GND (MOTOR)
ALWAYS 13V
ALWAYS 55V
TO PW-1 CN512
F5401 T315mA 250V
GND M
CN701
AV
SC
BAND 1
BAND 2
PWM
CLK
DI
CS
BG/L
TO TM-1 CN711
CN702
AD MUTE
SYNC DET
AFT C
MB
AFT
TO TM-3 CN732
IC161 BA7021 INPUT SELECT
L1601 100μ
L6601 15μH
L6602 15μH
D1602 1SS133
R1628 10K
B1602 2SC3399 INVERTER
C1601 47/6.3
C1602 47/6.3
C1605 0.01
C1604 100/6.3
C6601 100/6.3
C6602 100/6.3
R1607 47K
R1606 47K
R1603 10K
R1601 4.7K
R6002 390
R6001 390
D1601 1SS133
C1616 0.01
TP163
TP162
CN164
RF SW P
PB EE 5V
PB C
GND
PB Y
REC Y
GND
REC C
REC 12V
TO VP-1 CN181
SWD 5V
BST GATE
GND
REC C
PAL H
REC EE 5V
PB C
DDR H
TO VD-2 CN131
LP H
VLP
C SYNC
FSC
SWD 5V
BST GATE
GND
REC C
PAL H
REC EE 5V
PB C
DDR H
TO VD-1 CN103
GND
ALWAYS 5.8V
SWD 12V
PB H
REC H
VD OUT
VD OUT
GND
VD IN
TO VD-1 CN101
RF SW P
PB EE 5V
PB C
GND
PB Y
REC Y
GND
REC C
REC 12V
TO VD-1 CN102
JP211
JP212
BIAS -
BIAS +
SWD 12V
REC H
PB H
LP H
TO AD-1 CN202
AD MUTE
AD OUT
GND
AD LINE IN
AD TUNER IN
EXT (H)
TO AD-1 CN203

VHR-4100EX
VHR-4100EV
VHR-4100G

D

RCUIT (VHR-4100EX, EV 1AC-9-B1CC-00107) (VHR-4100G 1AC-9-B1CC-00100)


IC302 LB1641 ML DRIVER
D3002 DS135
D3003 1SS133
R3084 3.3Ω1/2W
C3082 0.1/50
C3081 0.01/25
R3083 750
D3082 MTZJ5.6B
D3081 MTZJ8.2B
RB303 3.9K×3
RB302 3.9K×3
R3133 18K
R3113 1K
R3114 1K
R3115 1K
R3116 1K
R3134 1K
R3124 22K
R3125 30K
R3043 30K
R3044 30K
R3045 6.8K
R3041 1K
C3041 0.001/50
R3042 1.5K
R3046 120K
C3042 100/6.3
R3001 1K
RB302
C3072 0.1
C3073 100/6.3
IC351 LC7417-8074 SERVO C.P.U.
MODE OUT
ST+SLOW
REF-TRK
D-MD2
D-MD1
D-PH
TRK-CR
SLOW-CR
MC-BR
SP
LP
T-SPEED
C-FG2
C-FG1
F/R
CPE
CSE
VDD
C-ST/SP
C-P
DPE
FHE
DSE
DFG
0/1 CLK
0/1 DATA
SV S CLK
SVS DATA
NTSC/PAL
REF
VDD
FSC
VSS
C-SYNC
ENV SW
VLP
ROT ARY
HAMP SW
RF SW
AF SW
DL 1
DL 2
CTL
REMARK
REC-CTL
D-P
DPG-MM
DPG
R3549 150K
R3516 270K
C3513 0.012
R3539 1.5K
D3503 1SS133
D3504 1SS133
R3518 22K
R3519 22K
C3534 0.1
C3533 47/6.3
C3514 220P
C3540 0.018
R3541 1K
C3501 0.022
R3501 33K
VR351 200K
B3502 2SC3399 SWITCH
R3570 47K
R3544 100K
Q3501 2SC536 SWITCH
R3545 150K
D3501 1SS133
D3502 1SS133
R3514 150K
C3512 22/6.3
R3512 330K
R3513 27K
Q3503 2SD734 SWITCH
R3562 22K
R3563 20K
R3511 10K
C3510 0.0068
C3511 22/6.3
R3561 100K
C3539 0.068
R3542 10K
R3528 150K
C3522 0.1
C3521 0.047
C3523 0.12
C3538 47/6.3
C3526
R3509 47K
R3510 47K
C3508 0.0022
C3509 0.0015
R3507 15K
C3507 22/6.3
R3506 330K
C3505 0.015
C3506 22/6.3
R3508 150K
R3502 100K
R3503 100K
C3502 0.015
C3503 0.0068
THRESH SELECT
S W LOGIC
TRAP
REC AMP
VCC1
VCC2
GND2
C3519 0.001
C3520 0.039
R3527 510
R3526 510
C3537 47/6.3
R3538 10K
SW 5V
R3540 10K
B3901 2SC3400 SWITCH
B3902 2SA1348 SWITCH
Q3901 2SC536 AMP
R3901 2.7K
R3902 22K
R3903 3.3K
R3904 2.2K
D3901 1SS133
D3902
CN305
R3307 10K
B3303 DTA144 SWITCH
D3308
D3310
D3306
R3304 1K
D3307
C3302 100μ/16
R3305 1K
D3309
C3301 220μ/16
D3301
D3303
D3302
R3301 22K
B3301 DTC144 SWITCH
R3303 1K
D3304
D3305
B3302 DTC144 SWITCH
DIODE ALL 1SS133
SY-4
Q7002 2SA984K REG
R7009 3.3K
SWD 12V
R7008 820
D7001 1SS133
D7002 MTZ12A
R7010 15K
C7003 10K
IC702 LA7910 BAND SELECTOR
Vcc1 NC Vcc2 GND BAND1 BAND2 HB LB
R7001 3.9K
C7004 22/50
L6003 10μ
C6005 4.7/25
C6003 1/50
C6002 4.7/25
L6002 10μ
C7002 0.01
IC703 UPC574J (L5631)REG
IC701 M6M80011P or M6M80021P MEMORY
CS CLK DI DO Vcc RES GND
Q7001 2SC2960-F SWITCH
R7002 10K
R7003 10K
R7005 47K
C7005 180P
C7006 0.1(TF)
R7006 22K
C7007 0.33(TF)
R7007 4.7K
L6004 10μ
C6004 0.1μ (TF)
R7004 33K
Q1601 2SA608 SWITCH
R1611 5.6K
R1610 5.6K
D1604 1SS133
R1613 56
B1601 2SC3399 SWITCH
D1603 1SS133
R1608 22K
R1612 22K
C1603 0.1
TP161
(SWD 12V)
L1603 100μ
Q1602 2SA608 BUFFER
Q1603 2SA608F BUFFER
Q1604 2SC536 AMP
R1620 5.6K
R1615 560
R1617 560
D1605 1SS133
C1606 470/6.3
R1622 1K
L1602 100μ
R1625 560
C1610 100/16
C1611
R1616 100
R1618 75
D1606 1SS133
C1608 33P
C1609 39P
C1607 47/16
R1624 1.8K
R1623 820
C1612 22/10
Q1605 2SA608 BUFFER
R1614 1.2K
R1619 1.3K
R1621 1.8K
SWD 5V
L1601 100μ
IC161 BA7021 INPUT SELECT
D1602 1SS133
R1628 10K
B1602 2SC3399 INVERTER
C1601 47/6.3
C1616 0.01
R1607 47K
R1603
R1604
R1606 47K
C1604 100/6.3
R6002 390
R6001 390
D1601 1SS133
C1602 47/6.3
F2052
F2151
R2110 1.8K
C2151 150P
R2107 2.7K
R2109 820
R2105 820
R2102 4.3K
R2101 30K
R2108 2.7K
L6006 10μ
R6004 390K
R6005 470K
C6001 0.1μ(TF)
R2104 4.3K
R2103 47K
TP162
JP211
JP212
RF SW P
PB EE 5V
PB C
GND
PB Y
REC Y
GND
REC C
REC 12V
TO VD-1 CN102
BIAS -
BIAS +
SWD 12V
REC H
PB H
LP H
TO AD-1 CN202
AD MUTE
AD OUT
GND
AD LINE IN
AD TUNER IN
EXT (H)
TO AD-1 CN203
VD IN
VD IN
MOD (SWD 5V)
B+T (ALWAYS 5V)
TO RF CONVERTER
IF
HB
AFT-C
AGC
SYNC DET
VD OUT
AD MUTE
AD OUT
TO TN-1
IF
HB
AFT
LB
AGC
HB
TU
UB
TO TUNER

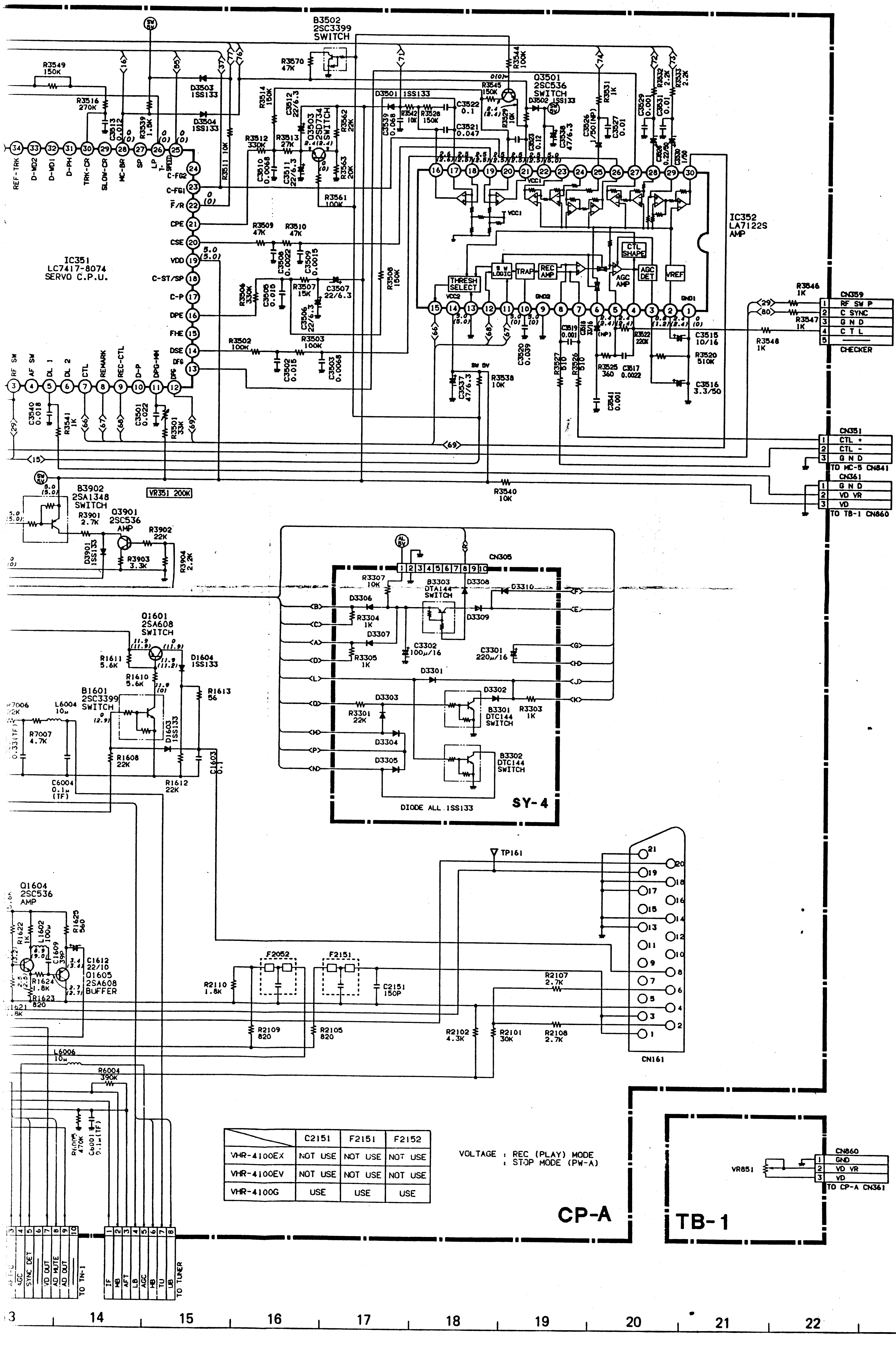
	C2151	F2151	F2152
VHR-4100EX	NOT USE	NOT USE	NOT USE
VHR-4100EV	NOT USE	NOT USE	NOT USE
VHR-4100G	USE	USE	USE

VOLTAGE : REC (PLAY)
: STOP MODE (

C

D

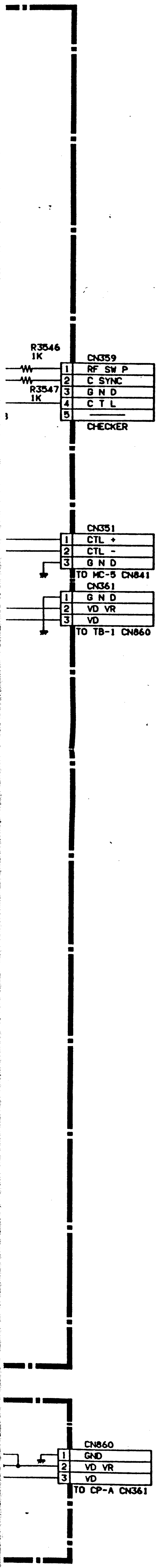
1CC-00100)


IC351
LC7417-8074
SERVO C.P.U.
IC352
LA7122S
AMP
B3502
2SC3399
SWITCH
Q3501
2SC536
SWITCH
Q3503
2SD734
SWITCH
D3501 1SS133
D3502 1SS133
D3503 1SS133
D3504 1SS133
THRESH SELECT
SW LOGIC
TRAP
REC AMP
CTL SHAPE
AGC AMP
AGC DET
VREF
CN359
RF SW P
C SYNC
GND
CTL
CHECKER
CN351
CTL +
CTL -
GND
TO MC-5 CN841
CN361
GND
VD VR
VD
TO TB-1 CN860
VR351 200K
B3902
2SA1348
SWITCH
Q3901
2SC536
AMP
Q1601
2SA608
SWITCH
B1601
2SC3399
SWITCH
Q1604
2SC536
AMP
Q1605
2SA608
BUFFER
CN305
B3303
DTA144
SWITCH
B3301
DTC144
SWITCH
B3302
DTC144
SWITCH
DIODE ALL 1SS133
SY-4
TP161
F2052
F2151
C2151 150P
CN161
TO TN-1
TO TUNER
CP-A
TB-1
CN860
GND
VD VR
VD
TO CP-A CN361
VR851
13
14
15
16
17
18
19
20
21
22
23
24

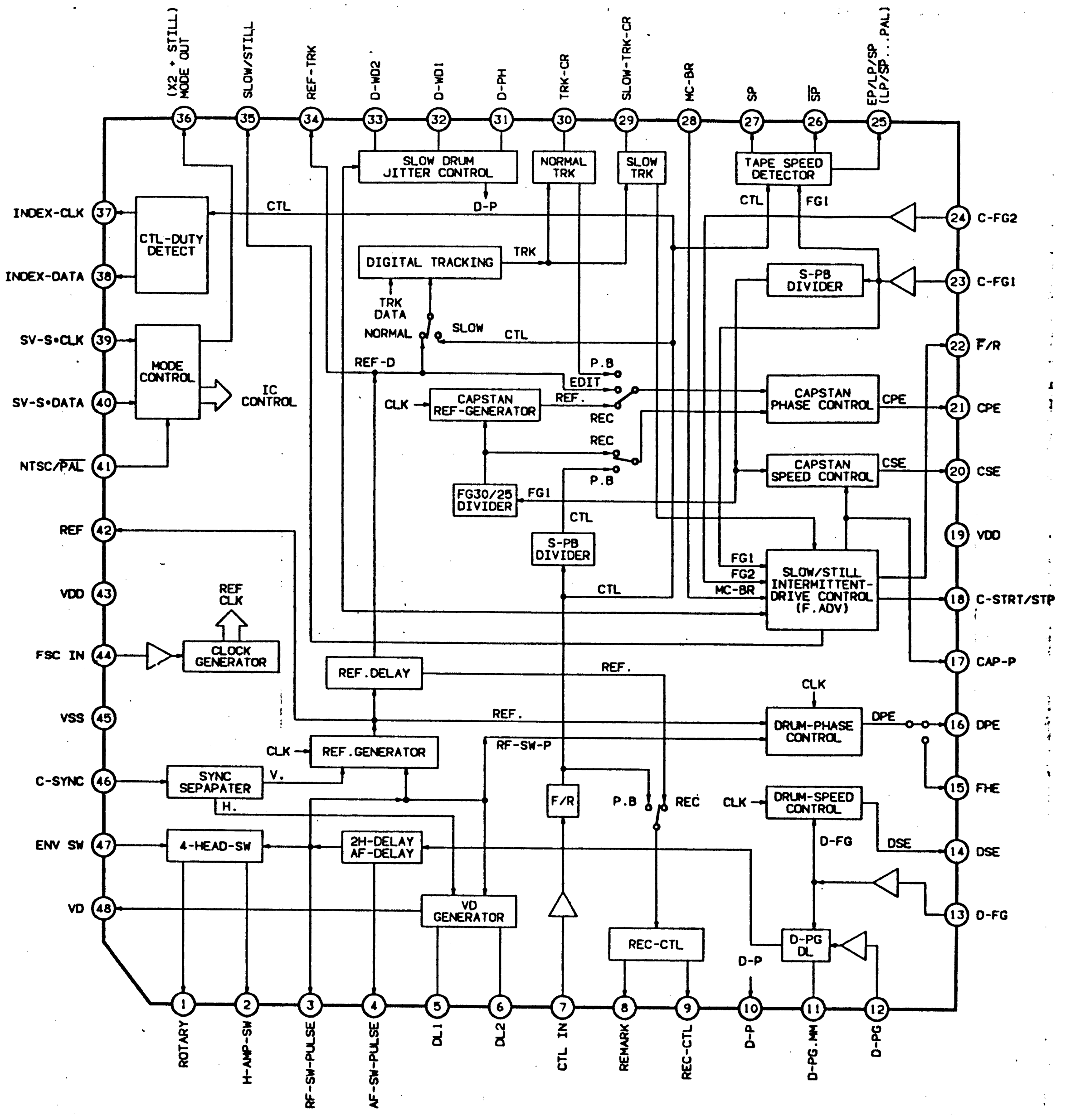
	C2151	F2151	F2152
VHR-4100EX	NOT USE	NOT USE	NOT USE
VHR-4100EV	NOT USE	NOT USE	NOT USE
VHR-4100G	USE	USE	USE

VOLTAGE : REC (PLAY) MODE
: STOP MODE (PW-A)

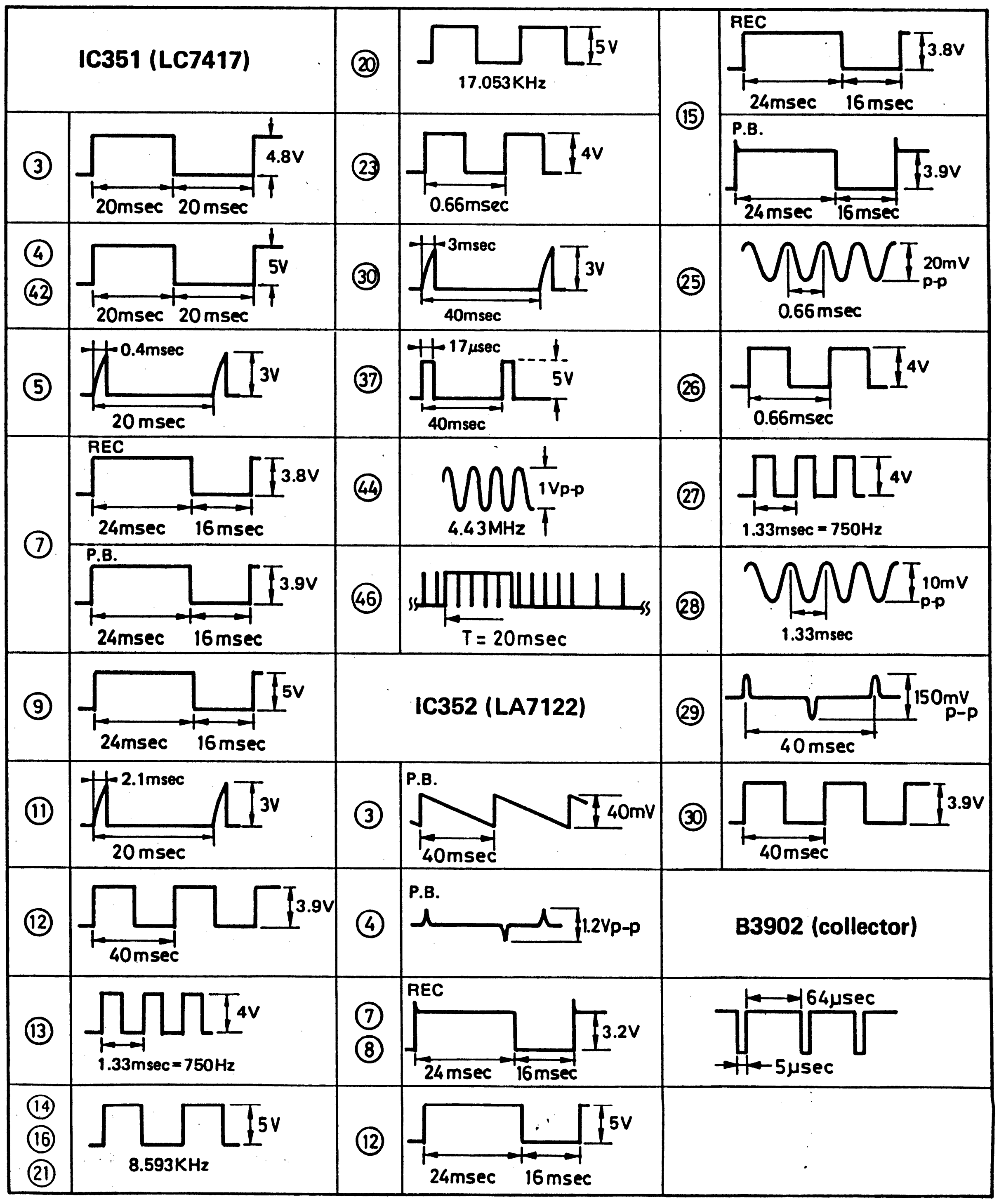
D


R3546
1K
R3547
1K
CN359
1 RF SW P
2 C SYNC
3 G N D
4 C T L
5 ———
CHECKER
CN351
1 CTL +
2 CTL -
3 G N D
TO MC-5 CN841
CN361
1 G N D
2 VD VR
3 VD
TO TB-1 CN860
CN860
1 GND
2 VD VR
3 VD
TO CP-A CN361

IC351 (LC7417) DIGITAL SERVO IC. INTER BLOCK DIAGRAM

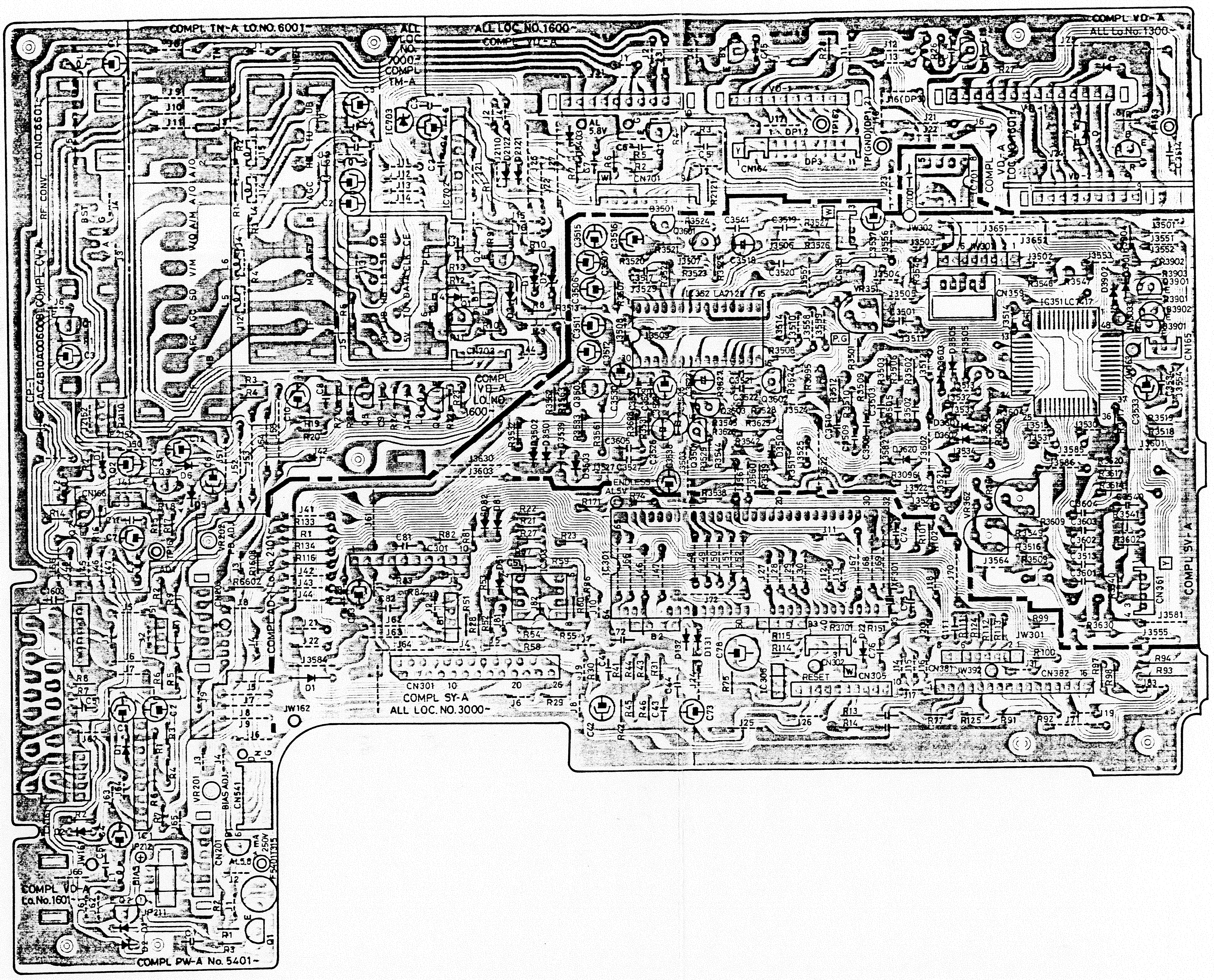

(X2 + STILL) MODE OUT 36
SLOW/STILL 35
REF-TRK 34
D-WD2 33
D-WD1 32
D-PH 31
TRK-CR 30
SLOW-TRK-CR 29
MC-BR 28
SP 27
SP 26
EP/LP/SP (LP/SP...PAL) 25
INDEX-CLK 37
INDEX-DATA 38
SV-S•CLK 39
SV-S•DATA 40
NTSC/PAL 41
REF 42
VDD 43
FSC IN 44
VSS 45
C-SYNC 46
ENV SW 47
VD 48
24 C-FG2
23 C-FG1
22 F/R
21 CPE
20 CSE
19 VDD
18 C-STRT/STP
17 CAP-P
16 DPE
15 FHE
14 DSE
13 D-FG
1 ROTARY
2 H-AMP-SW
3 RF-SW-PULSE
4 AF-SW-PULSE
5 DL1
6 DL2
7 CTL IN
8 REMARK
9 REC-CTL
10 D-P
11 D-PG.MM
12 D-PG
SLOW DRUM JITTER CONTROL
D-P
NORMAL TRK
SLOW TRK
TAPE SPEED DETECTOR
CTL
FG1
CTL-DUTY DETECT
CTL
DIGITAL TRACKING
TRK
TRK DATA
NORMAL
SLOW
CTL
S-PB DIVIDER
MODE CONTROL
IC CONTROL
REF-D
P.B
EDIT
REF.
REC
CLK
CAPSTAN REF-GENERATOR
CAPSTAN PHASE CONTROL
CPE
REC
P.B
CAPSTAN SPEED CONTROL
CSE
FG30/25 DIVIDER
FG1
CTL
S-PB DIVIDER
FG1
FG2
MC-BR
CTL
SLOW/STILL INTERMITTENT-DRIVE CONTROL (F.ADV)
REF CLK
CLOCK GENERATOR
REF.DELAY
REF.
CLK
REF.
DRUM-PHASE CONTROL
DPE
RF-SW-P
CLK
REF.GENERATOR
SYNC SEPAPATER
V.
H.
F/R
P.B
REC
CLK
DRUM-SPEED CONTROL
D-FG
DSE
4-HEAD-SW
2H-DELAY AF-DELAY
VD GENERATOR
REC-CTL
D-P
D-PG DL

WAVEFORM OF SERVO

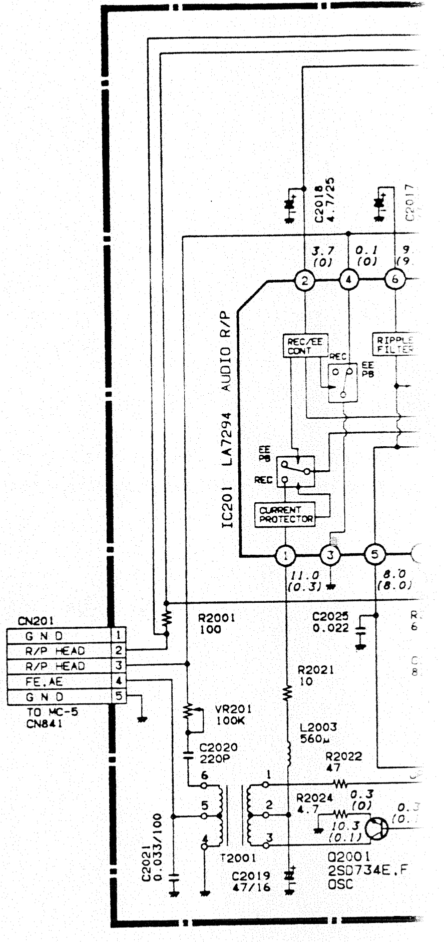


E

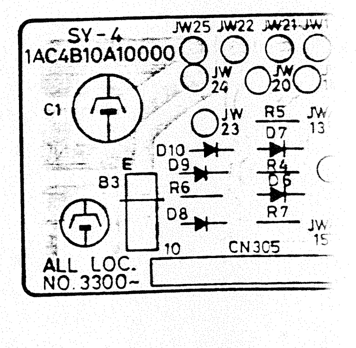
CP-1 MAIN P.C.B.


COMPL TN-A LO.NO.6001~
ALL LOC NO. 7000~ COMPL TM-A
ALL LOC.NO.1600~ COMPL VD-A
COMPL VD-A ALL Lo.No.1300~
COMPL CV-A LO.NO.6601~
RF CONV.
1AC4B10A00600
COMPL VD-A LO.NO. 1600~
COMPL AD-1 Lo.No. 2101~
COMPL SY-A ALL LOC. NO. 3000~
CN301
COMPL VD-A Lo.No.1601~
COMPL PW-A No. 5401~
IC351 LC7417
IC352 LA7121
IC301
RESET
ENDLESS
COMPL SY-A
CN361
BIAS ADJ.
mA 250V
K
J
I
H
G
F
E
D
C
B
A
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

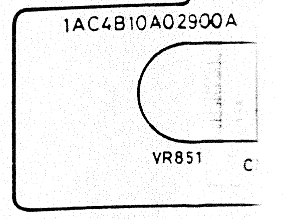
COMPL. AD-1


IC201 LA7294 AUDIO R/P
REC/EE CONT
CURRENT PROTECTOR
CN201
GND
R/P HEAD
R/P HEAD
FE. AE
GND
TO MC-5 CN841
R2001 100
C2025 0.022
R2021 10
VR201 100K
C2020 220P
L2003 560μ
R2022 47
R2024 4.7
C2021 0.033/100
T2001
C2019 47/16
Q2001 2SD734E,F OSC
C2018 4.7/25

SY-4 SY P.C

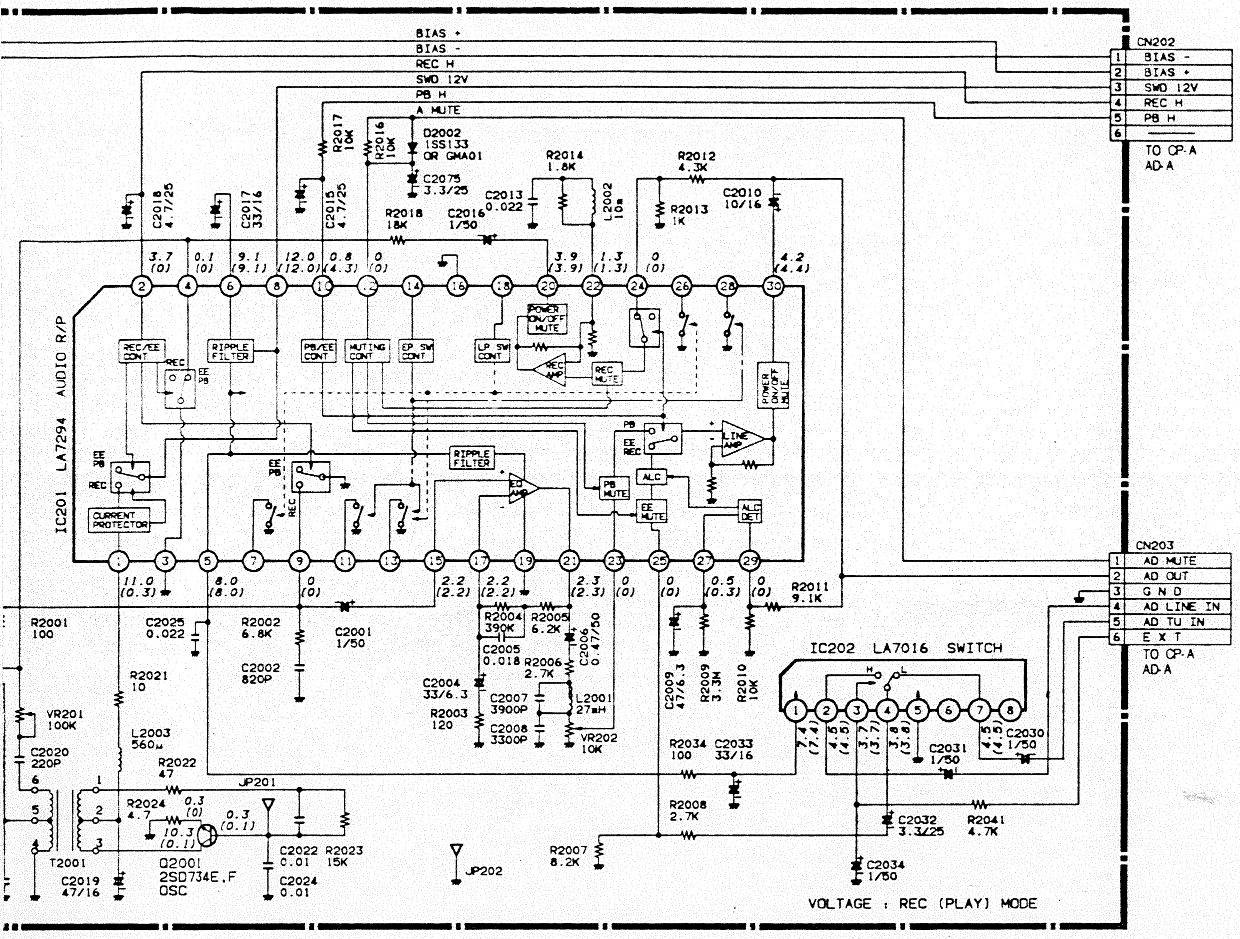

SY-4
1AC4B10A10000
C1
E
B3
ALL LOC. NO. 3300~
D10
D9
R6
D8
D7
R4
R5
R7
CN305
JW25 JW22 JW21
JW 24
JW 23
JW 20

TB-1 TERMINA


1AC4B10A02900A
VR851

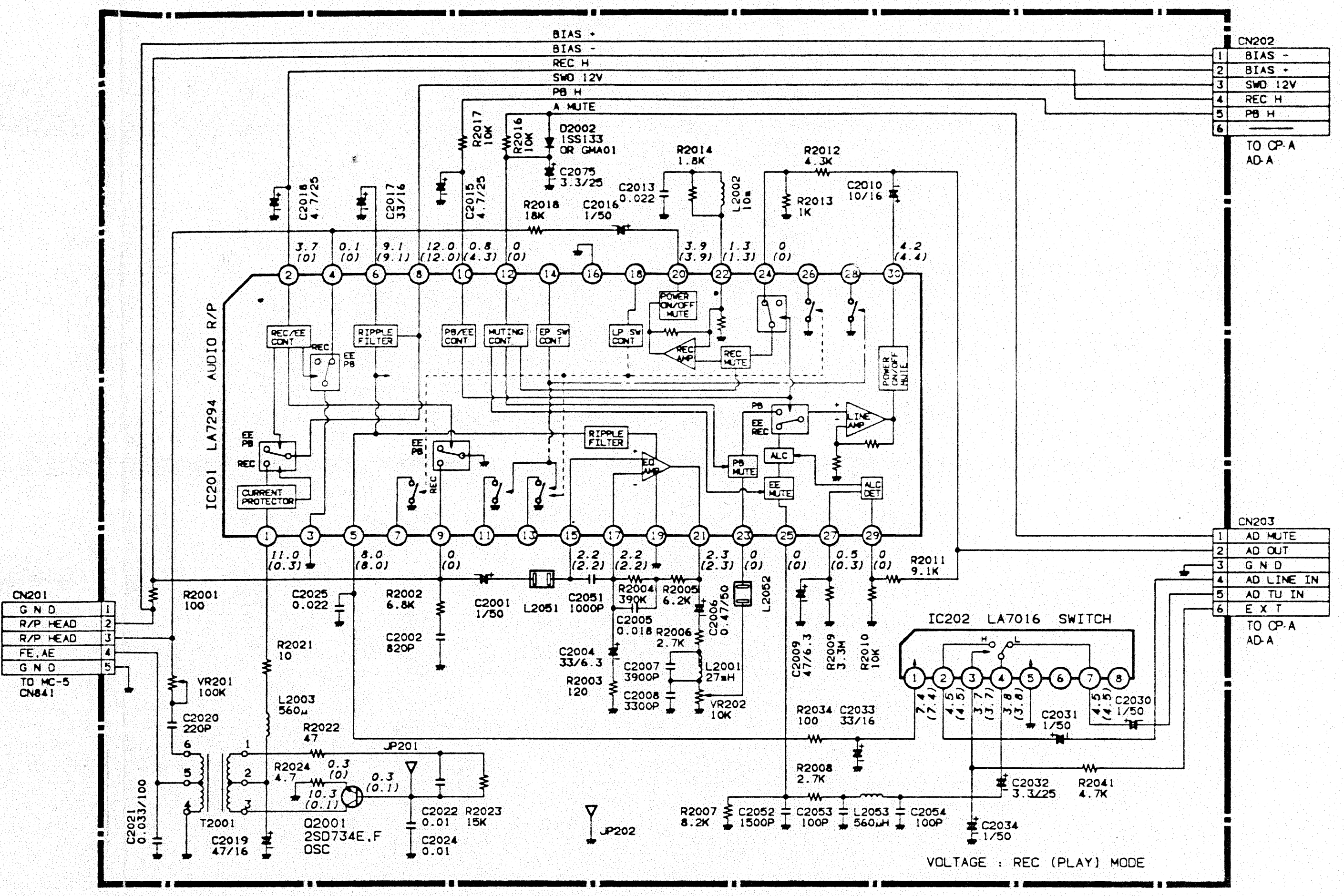
E

COMPL. AD-1 AUDIO CIRCUIT (VHR-4100EX, EV 1AC-0-B11A-01601)



BIAS +
BIAS -
REC H
SWD 12V
PB H
A MUTE
CN202
TO CP-A AD-A
CN203
AD MUTE
AD OUT
G N D
AD LINE IN
AD TU IN
E X T
IC201 LA7294 AUDIO R/P
IC202 LA7016 SWITCH
Q2001 2SD734E,F OSC
T2001
JP201
JP202
VOLTAGE : REC (PLAY) MODE

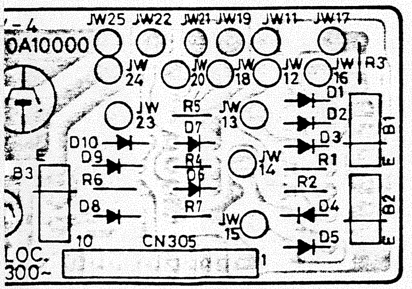
COMPL. AD-1 AUDIO CIRCUIT (VHR-4100G 1AC-0-B11A-01600)



BIAS +
BIAS -
REC H
SWD 12V
PB H
A MUTE
CN202
TO CP-A AD-A
CN203
AD MUTE
AD OUT
G N D
AD LINE IN
AD TU IN
E X T
CN201
G N D
R/P HEAD
R/P HEAD
FE, AE
G N D
TO MC-5 CN841
IC201 LA7294 AUDIO R/P
IC202 LA7016 SWITCH
Q2001 2SD734E,F OSC
T2001
JP201
JP202
VOLTAGE : REC (PLAY) MODE

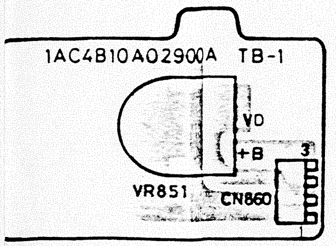
Ⓔ
VHR-4100EX
VHR-4100EV
VHR-4100G

SY-4 SY P.C.B.



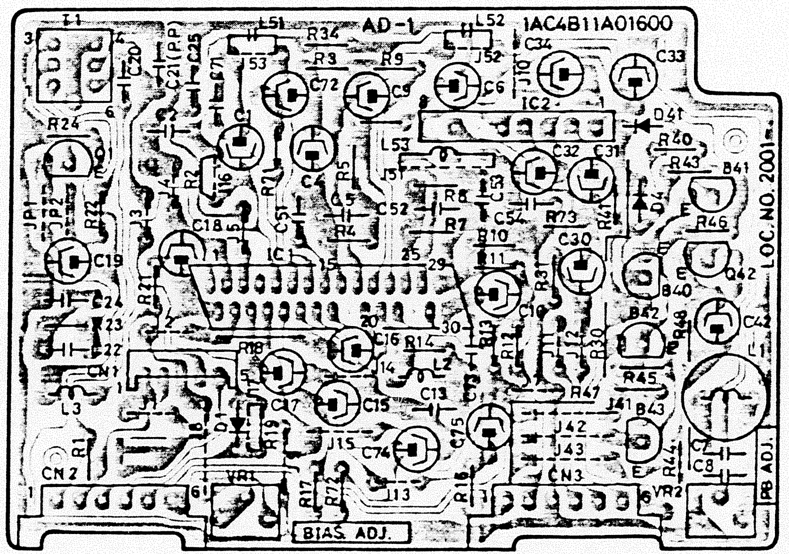
CN305
LOC. 300~

TB-1 TERMINAL P.C.B.



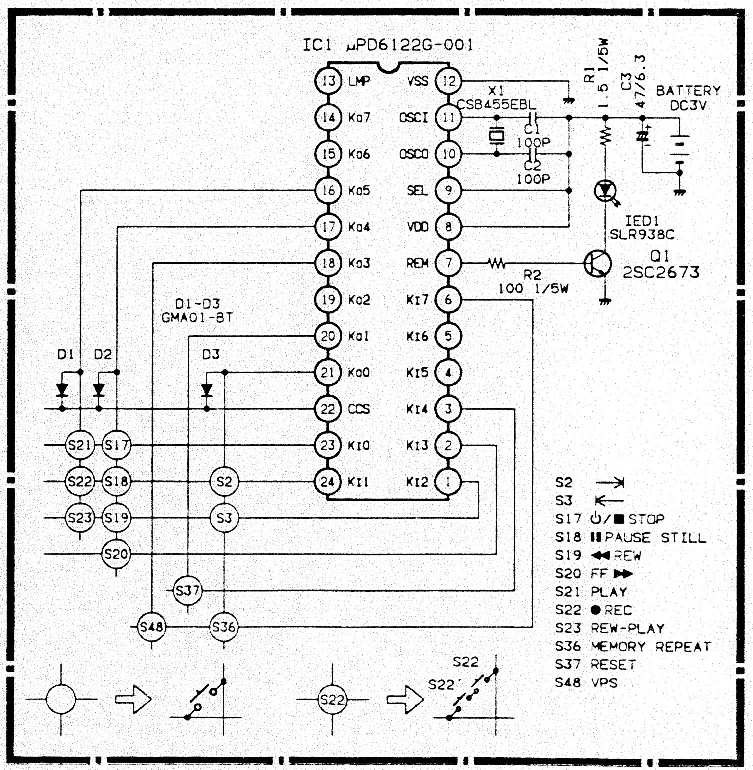
1AC4B10A02900A TB-1
VD
+B
VR851
CN860

AD-1 AUDIO P.C.B.



AD-1
1AC4B11A01600
LOC. NO. 2001~
BIAS ADJ.
PB ADJ.
CN1
CN2
CN3

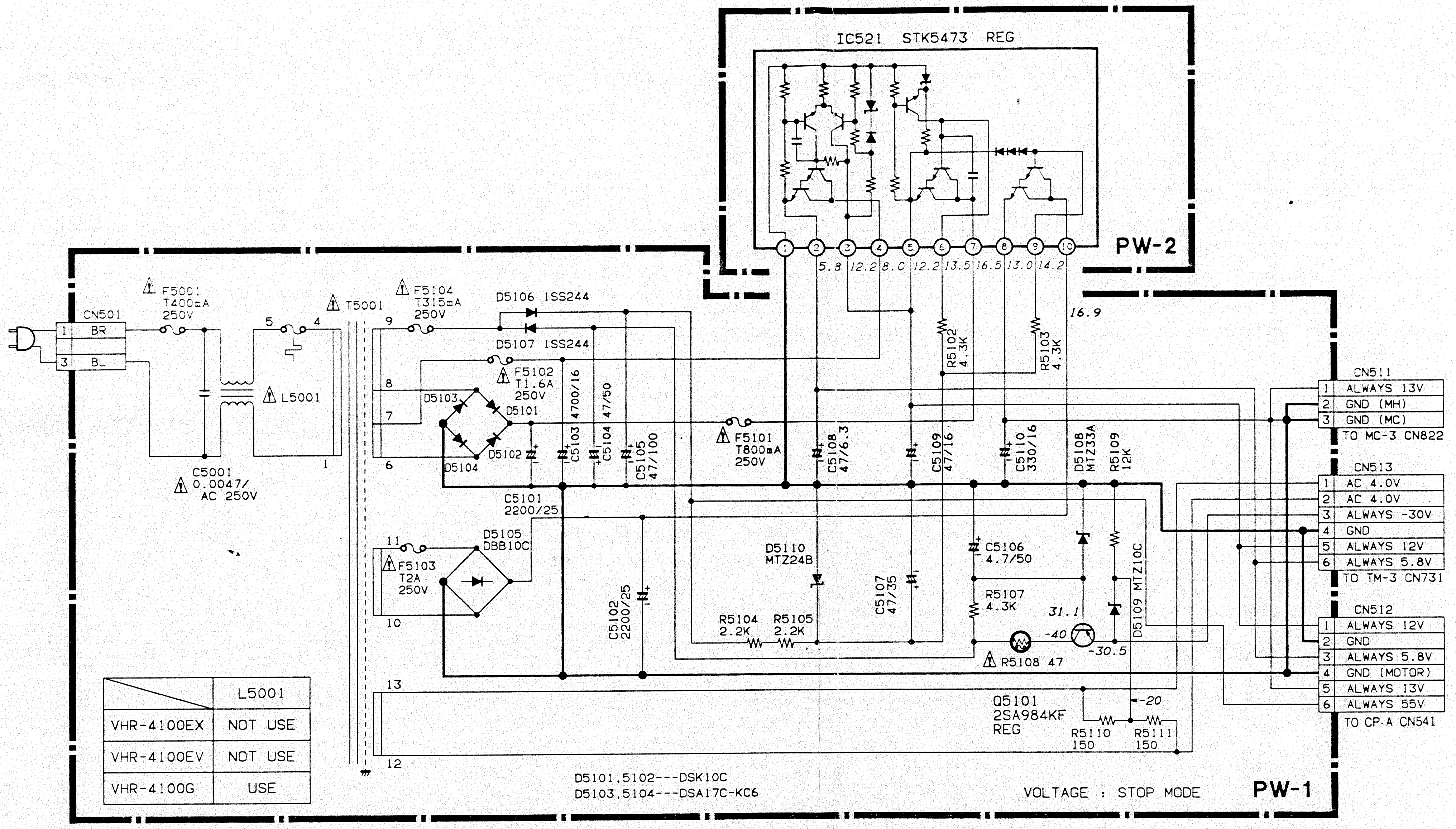
IR REMOTE CONTROL CIRCUIT (1AC-4-U10A-00100)



IC1 µPD6122G-001
X1 CSB455EBL
BATTERY DC3V
IED1 SLR938C
Q1 2SC2673
D1-D3 GMA01-BT
S2 →|
S3 |←
S17 ⏻/■ STOP
S18 ❚❚ PAUSE STILL
S19 ◀◀ REW
S20 FF ▶▶
S21 PLAY
S22 ● REC
S23 REW-PLAY
S36 MEMORY REPEAT
S37 RESET
S48 VPS

F

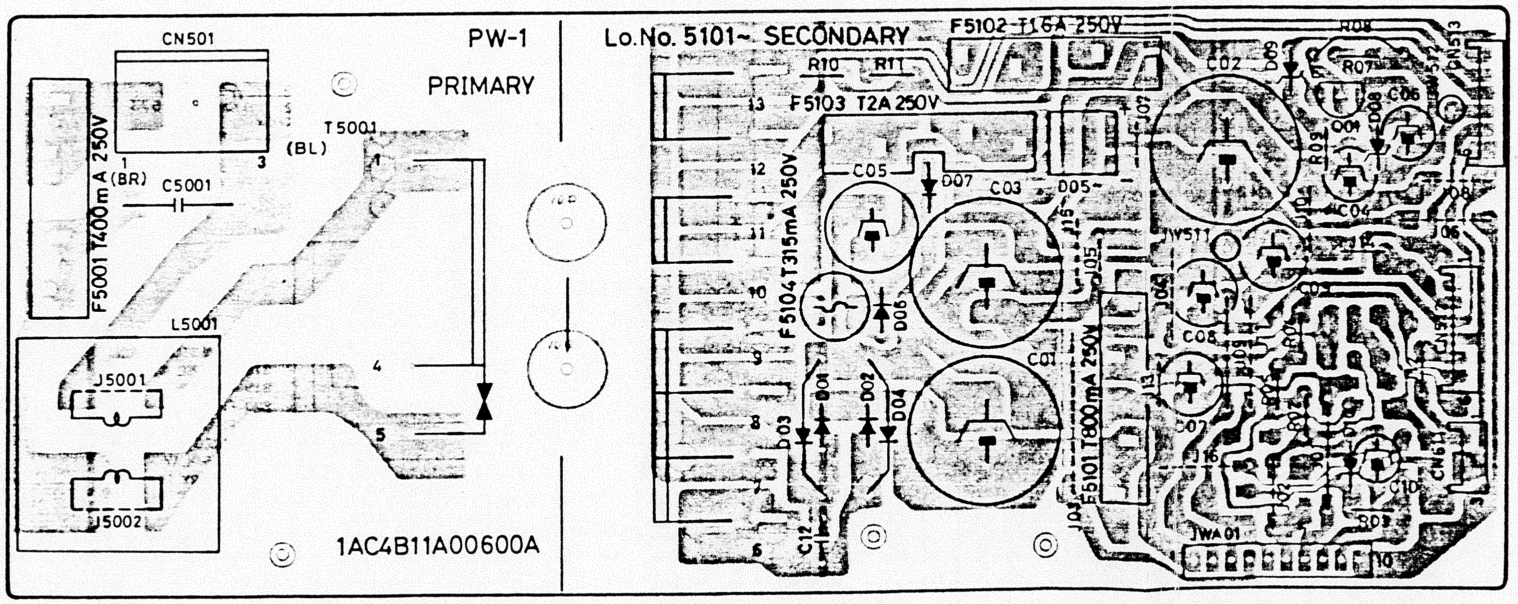
COMPL. PW-1 POWER SUPPLY CIRCUIT (VHR-4100EX, EV 1AC-0-B11A-00601)
(VHR-4100G 1AC-0-B11A-00600)
COMPL. PW-2 POWER SUPPLY CIRCUIT (1AC-0-B11A-01000)


IC521 STK5473 REG
PW-2
5.8
12.2
8.0
12.2
13.5
16.5
13.0
14.2
16.9
CN501
BR
BL
F5001 T400mA 250V
C5001 0.0047/ AC 250V
L5001
T5001
F5104 T315mA 250V
D5106 1SS244
D5107 1SS244
F5102 T1.6A 250V
D5103
D5101
D5102
D5104
C5103 4700/16
C5104 47/50
C5105 47/100
C5101 2200/25
D5105 DBB10C
F5103 T2A 250V
C5102 2200/25
F5101 T800mA 250V
C5108 47/6.3
D5110 MTZ24B
R5104 2.2K
R5105 2.2K
C5107 47/35
C5109 47/16
R5102 4.3K
R5103 4.3K
C5110 330/16
D5108 MTZ33A
R5109 12K
C5106 4.7/50
R5107 4.3K
31.1
-40
-30.5
R5108 47
D5109 MTZ10C
Q5101 2SA984KF REG
-20
R5110 150
R5111 150
CN511
1 ALWAYS 13V
2 GND (MH)
3 GND (MC)
TO MC-3 CN822
CN513
1 AC 4.0V
2 AC 4.0V
3 ALWAYS -30V
4 GND
5 ALWAYS 12V
6 ALWAYS 5.8V
TO TM-3 CN731
CN512
1 ALWAYS 12V
2 GND
3 ALWAYS 5.8V
4 GND (MOTOR)
5 ALWAYS 13V
6 ALWAYS 55V
TO CP-A CN541
D5101,5102---DSK10C
D5103,5104---DSA17C-KC6
VOLTAGE : STOP MODE
PW-1

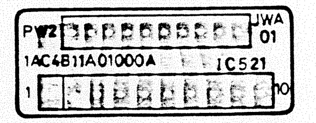
	L5001
VHR-4100EX	NOT USE
VHR-4100EV	NOT USE
VHR-4100G	USE

F
VHR-4100EX
VHR-4100EV
VHR-4100G

PW-1 POWER SUPPLY P.C.B.

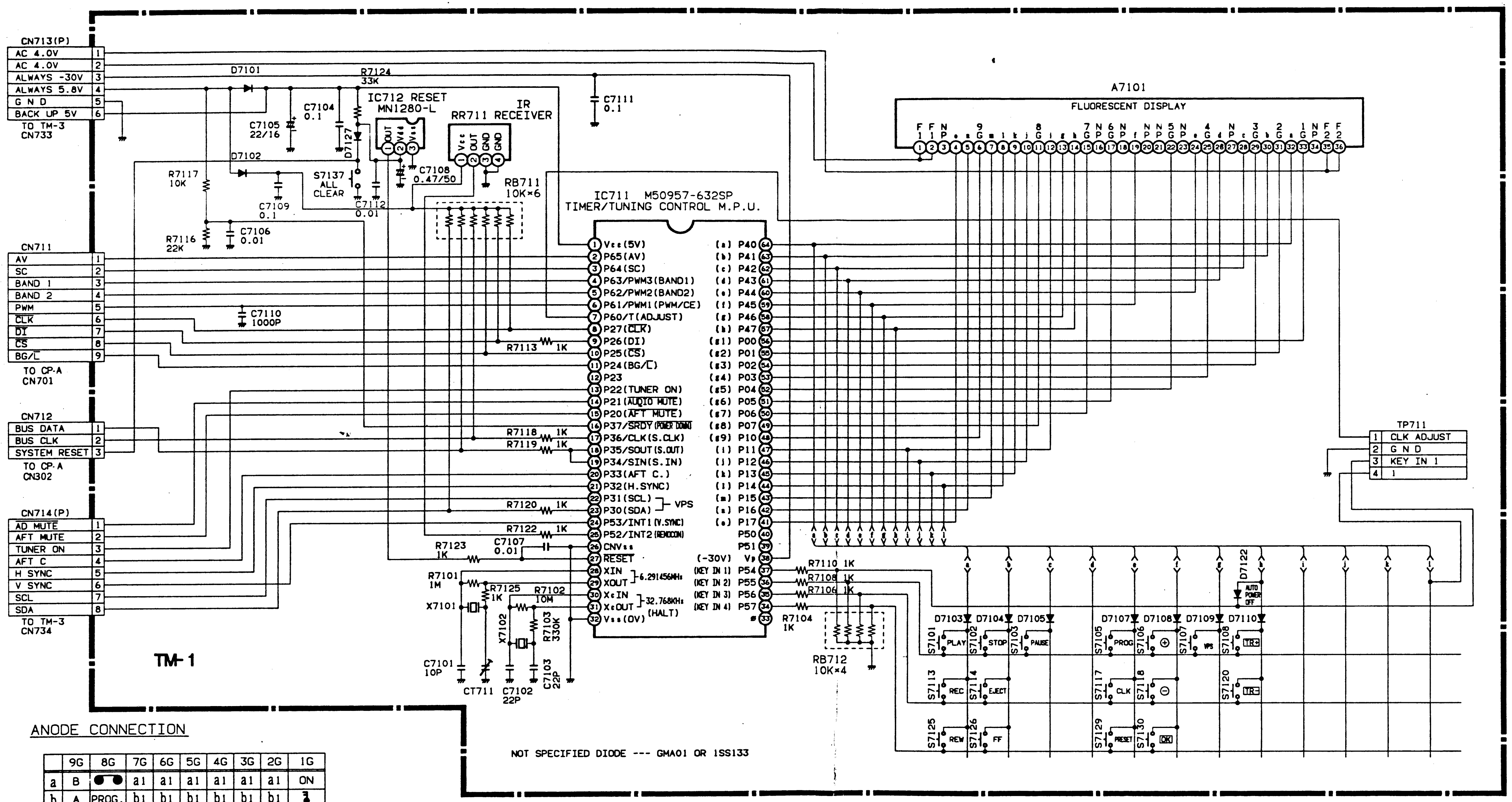

CN501
PW-1
PRIMARY
T5001
(BR)
(BL)
C5001
F5001 T400mA 250V
L5001
J5001
J5002
1AC4B11A00600A
Lo.No. 5101~ SECONDARY
F5102 T1.6A 250V
R10
R11
F5103 T2A 250V
C05
D07
C03
D05
F5104 T315mA 250V
D06
D01
D02
D03
D04
C12
C01
F5101 T800mA 250V
C02
R07
R08
Q01
C04
JW511
C08
C07
C06
CN511
CN512
CN513
JWA 01

PW-2 POWER SUPPLY P.C.B.


PW2
JWA 01
1AC4B11A01000A
IC521
1
10

F

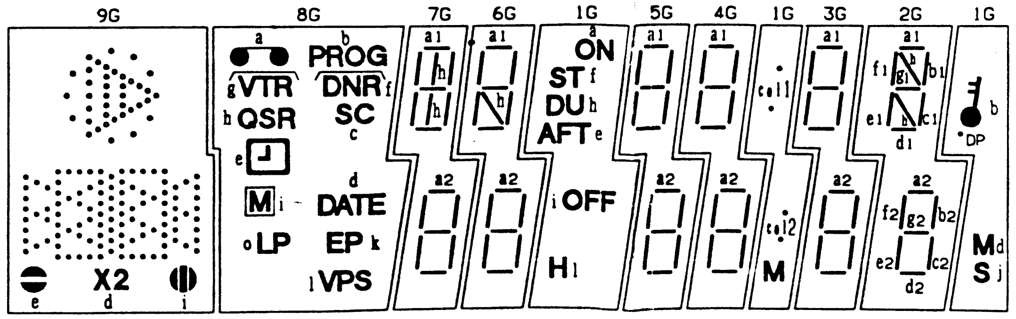
COMPL. TM-1 DISPLAY, TIMER, TUNING CONTROL CIRCUIT (1AC-0-B10A-00700)


CN713(P)
1 AC 4.0V
2 AC 4.0V
3 ALWAYS -30V
4 ALWAYS 5.8V
5 G N D
6 BACK UP 5V
TO TM-3
CN733
D7101
R7124
33K
C7104
0.1
C7105
22/16
D7127
IC712 RESET
MN1280-L
OUT
Vdd
Vss
IR
RR711 RECEIVER
Vcc
OUT
GND
GND
C7111
0.1
D7102
R7117
10K
S7137
ALL
CLEAR
C7108
0.47/50
C7109
0.1
C7112
0.01
RB711
10K×6
R7116
22K
C7106
0.01
CN711
1 AV
2 SC
3 BAND 1
4 BAND 2
5 PWM
6 CLK
7 DI
8 CS
9 BG/L
TO CP-A
CN701
C7110
1000P
R7113 1K
CN712
1 BUS DATA
2 BUS CLK
3 SYSTEM RESET
TO CP-A
CN302
CN714(P)
1 AD MUTE
2 AFT MUTE
3 TUNER ON
4 AFT C
5 H SYNC
6 V SYNC
7 SCL
8 SDA
TO TM-3
CN734
TM-1
IC711 M50957-632SP
TIMER/TUNING CONTROL M.P.U.
1 Vcc(5V)
2 P65(AV)
3 P64(SC)
4 P63/PWM3(BAND1)
5 P62/PWM2(BAND2)
6 P61/PWM1(PWM/CE)
7 P60/T(ADJUST)
8 P27(CLK)
9 P26(DI)
10 P25(CS)
11 P24(BG/L)
12 P23
13 P22(TUNER ON)
14 P21(AUDIO MUTE)
15 P20(AFT MUTE)
16 P37/SRDY(POWER DOWN)
17 P36/CLK(S.CLK)
18 P35/SOUT(S.OUT)
19 P34/SIN(S.IN)
20 P33(AFT C.)
21 P32(H.SYNC)
22 P31(SCL)
23 P30(SDA)
VPS
24 P53/INT1(V.SYNC)
25 P52/INT2(REMOCON)
26 CNVss
27 RESET
28 XIN
29 XOUT
6.291456MHz
30 XcIN
31 XcOUT
32.768KHz
(HALT)
32 Vss(0V)
(a) P40 64
(b) P41 63
(c) P42 62
(d) P43 61
(e) P44 60
(f) P45 59
(g) P46 58
(h) P47 57
(g1) P00 56
(g2) P01 55
(g3) P02 54
(g4) P03 53
(g5) P04 52
(g6) P05 51
(g7) P06 50
(g8) P07 49
(g9) P10 48
(i) P11 47
(j) P12 46
(k) P13 45
(l) P14 44
(m) P15 43
(n) P16 42
(o) P17 41
P50 40
P51 39
(-30V) Vp 38
(KEY IN 1) P54 37
(KEY IN 2) P55 36
(KEY IN 3) P56 35
(KEY IN 4) P57 34
33
R7118 1K
R7119 1K
R7120 1K
R7122 1K
R7123
1K
C7107
0.01
R7101
1M
R7125
1K
R7102
10M
X7101
X7102
R7103
330K
C7101
10P
CT711
C7102
22P
C7103
22P
R7110 1K
R7108 1K
R7106 1K
R7104
1K
RB712
10K×4
A7101
FLUORESCENT DISPLAY
F1 F1 NP 9G 8G 7G NP 6G NP NP NP 5G NP 4G NP 3G 2G 1G NP F2 F2
TP711
1 CLK ADJUST
2 G N D
3 KEY IN 1
4 1
D7122
AUTO POWER OFF
D7103 D7104 D7105 D7107 D7108 D7109 D7110
S7101 PLAY
S7102 STOP
S7103 PAUSE
S7105 PROG
S7106 ⊕
S7107 VPS
S7108 TR+
S7113 REC
S7114 EJECT
S7117 CLK
S7118 ⊖
S7120 TR-
S7125 REW
S7126 FF
S7129 PRESET
S7130 OK
NOT SPECIFIED DIODE --- GMA01 OR 1SS133

ANODE CONNECTION

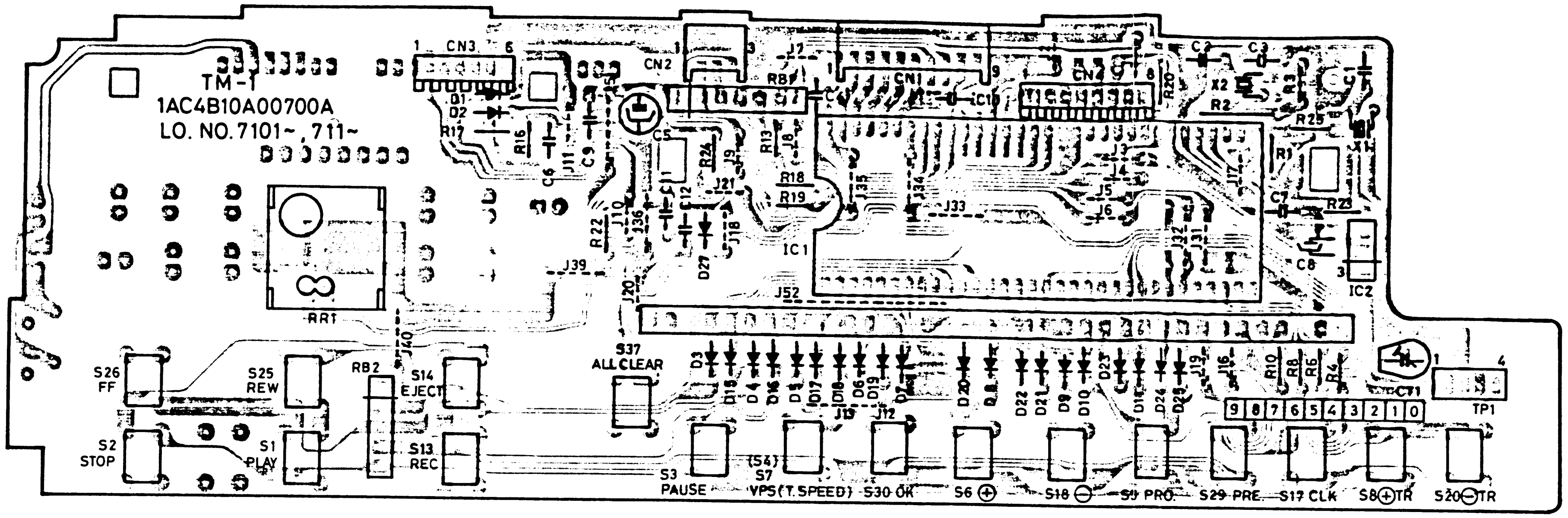
	9G	8G	7G	6G	5G	4G	3G	2G	1G
a	B	●━●	a1	a1	a1	a1	a1	a1	ON
b	A	PROG.	b1	b1	b1	b1	b1	b1	🌡
c	-	SC	c1	c1	c1	c1	c1	c1	DP
d	×2	DATE	d1	d1	d1	d1	d1	d1	M(1)
e	⊖	⊡	e1	e1	e1	e1	e1	e1	AFT
f	C	DNR	f1	f1	f1	f1	f1	f1	ST
g	D	VTR	g1	g1	g1	g1	g1	g1	col*1
h	-	QSR	/	\	-	-	-	\	DU
i	⦶	[M]	a2	a2	a2	a2	a2	a2	OFF
j	E	-	b2	b2	b2	b2	b2	b2	S
k	I	EP	c2	c2	c2	c2	c2	c2	-
l	H	VPS	d2	d2	d2	d2	d2	d2	H
m	J	-	e2	e2	e2	e2	e2	e2	M(2)
n	F	-	f2	f2	f2	f2	f2	f2	-
o	G	LP	g2	g2	g2	g2	g2	g2	col*2

GRID ASSIGNMENT


9G
8G
7G
6G
1G
5G
4G
1G
3G
2G
1G
X2
PROG
VTR
DNR
QSR
SC
DATE
LP
EP
VPS
ON
ST
DU
AFT
OFF
H
M
DP
M
S

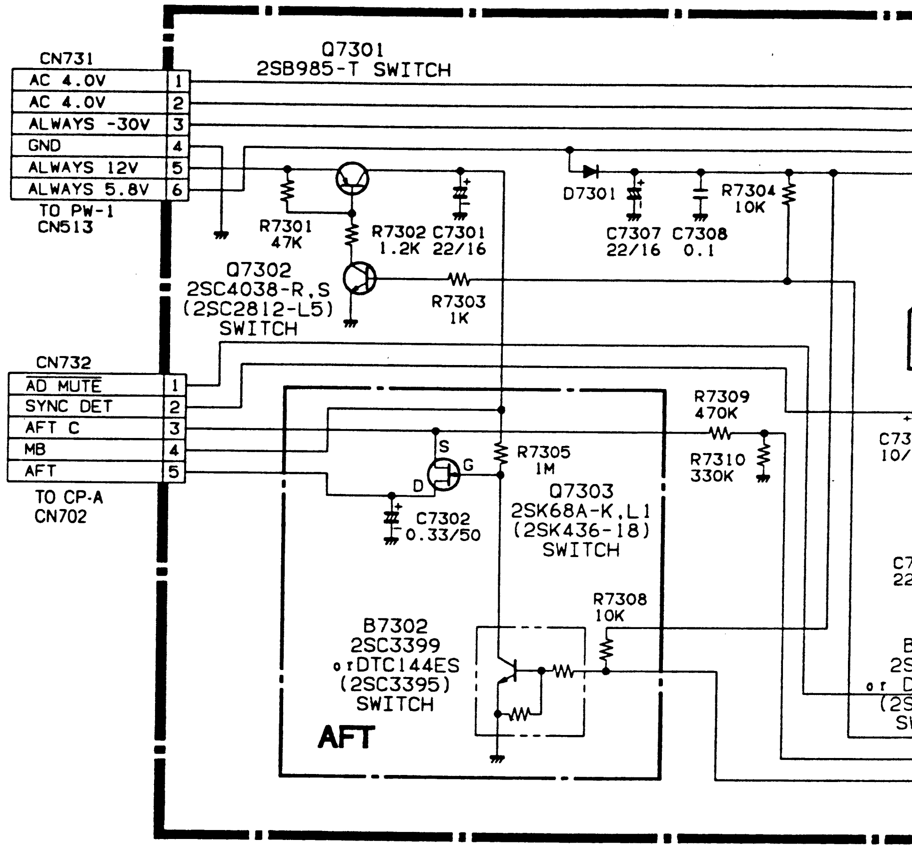
6

TM-1 DISPLAY, TIMER, TUNING CONTROL P.C.B.



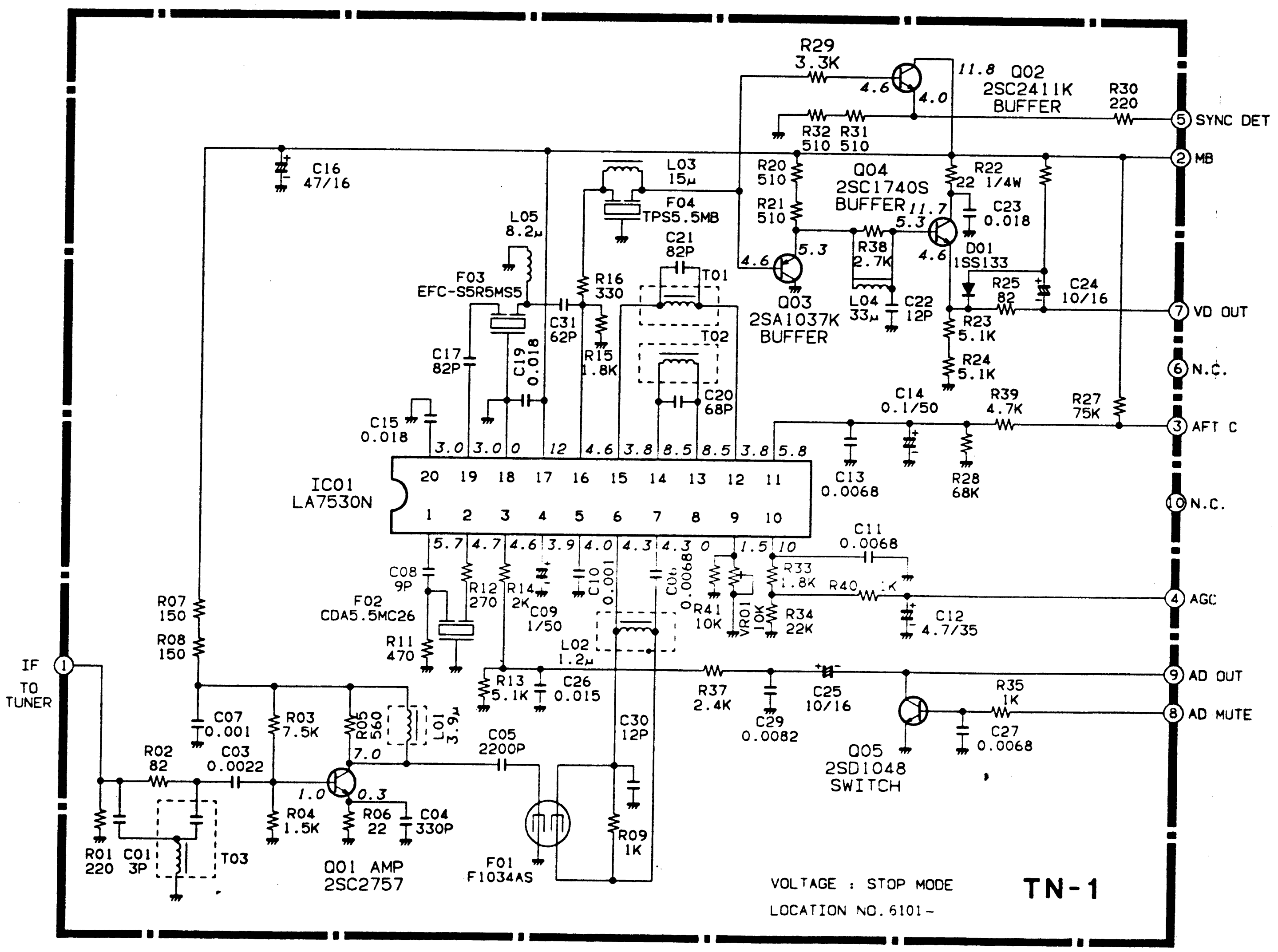
TM-1
1AC4B10A00700A
LO. NO.7101~,711~
CN3
CN2
CN1
IC1
IC2
RR1
RB1
RB2
J39
J52
S37 ALL CLEAR
S26 FF
S25 REW
S14 EJECT
S2 STOP
S1 PLAY
S13 REC
S3 PAUSE
(S4) S7 VPS(T.SPEED)
S30 OK
S6 ⊕
S18 ⊖
S9 PRO.
S29 PRE.
S17 CLK
S8⊕TR
S20⊖TR
TP1

COMPL. TM-3 VPS, AFT CIRCUIT (VHR-4100EX



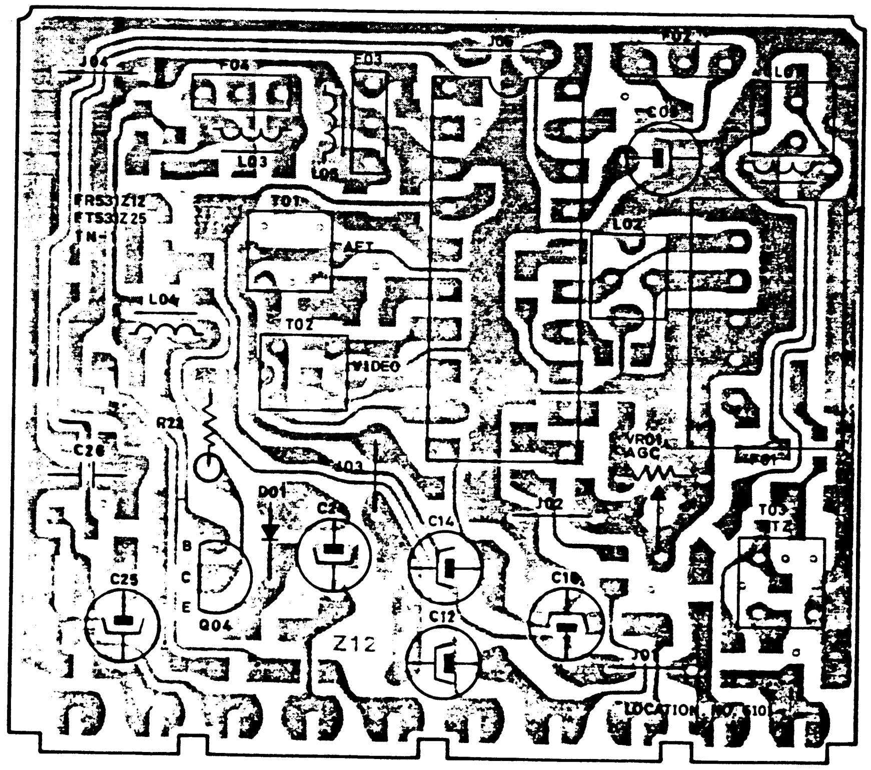
CN731
AC 4.0V
AC 4.0V
ALWAYS -30V
GND
ALWAYS 12V
ALWAYS 5.8V
TO PW-1 CN513
Q7301 2SB985-T SWITCH
R7301 47K
R7302 1.2K
C7301 22/16
D7301
C7307 22/16
C7308 0.1
R7304 10K
Q7302 2SC4038-R,S (2SC2812-L5) SWITCH
R7303 1K
CN732
AD MUTE
SYNC DET
AFT C
MB
AFT
TO CP-A CN702
R7309 470K
R7310 330K
R7305 1M
C7302 0.33/50
Q7303 2SK68A-K,L1 (2SK436-18) SWITCH
R7308 10K
B7302 2SC3399 or DTC144ES (2SC3395) SWITCH
AFT

COMPL. TN-1 TUNER IF CIRCUIT (143-0-233V-36200)

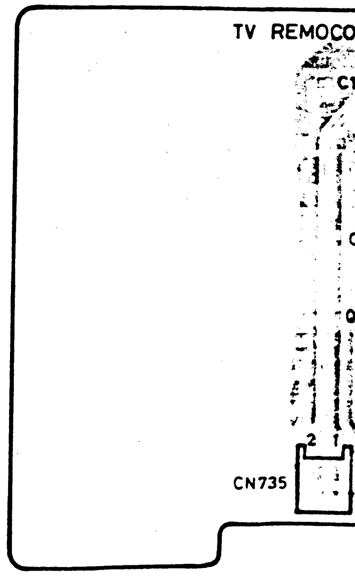


IF TO TUNER
R01 220
C01 3P
T03
R02 82
C03 0.0022
C07 0.001
R03 7.5K
R04 1.5K
R05 560
R06 22
C04 330P
L01 3.9μ
Q01 AMP 2SC2757
R07 150
R08 150
C16 47/16
F01 F1034AS
C05 2200P
C30 12P
R09 1K
F02 CDA5.5MC26
C08 9P
R11 470
R12 270
R14 2K
C09 1/50
C10 0.001
L02 1.2μ
R13 5.1K
C26 0.015
IC01 LA7530N
C15 0.018
C17 82P
F03 EFC-S5R5MS5
C19 0.018
C31 62P
L05 8.2μ
R16 330
R15 1.8K
L03 15μ
F04 TPS5.5MB
C21 82P
T01
T02
C20 68P
R29 3.3K
Q02 2SC2411K BUFFER
R30 220
R32 510
R31 510
R20 510
R21 510
Q03 2SA1037K BUFFER
Q04 2SC1740S BUFFER
R38 2.7K
L04 33μ
C22 12P
R22 22 1/4W
C23 0.018
D01 1SS133
R25 82
C24 10/16
R23 5.1K
R24 5.1K
C14 0.1/50
R39 4.7K
R27 75K
C13 0.0068
R28 68K
C11 0.0068
R33 1.8K
R40 1K
R41 10K
VR01 10K
R34 22K
C12 4.7/35
R37 2.4K
C29 0.0082
C25 10/16
R35 1K
C27 0.0068
Q05 2SD1048 SWITCH
⑤ SYNC DET
② MB
⑦ VD OUT
⑥ N.C.
③ AFT C
⑩ N.C.
④ AGC
⑨ AD OUT
⑧ AD MUTE
VOLTAGE : STOP MODE
LOCATION NO. 6101~
TN-1

TN-1 TUNER IF P.C.B.



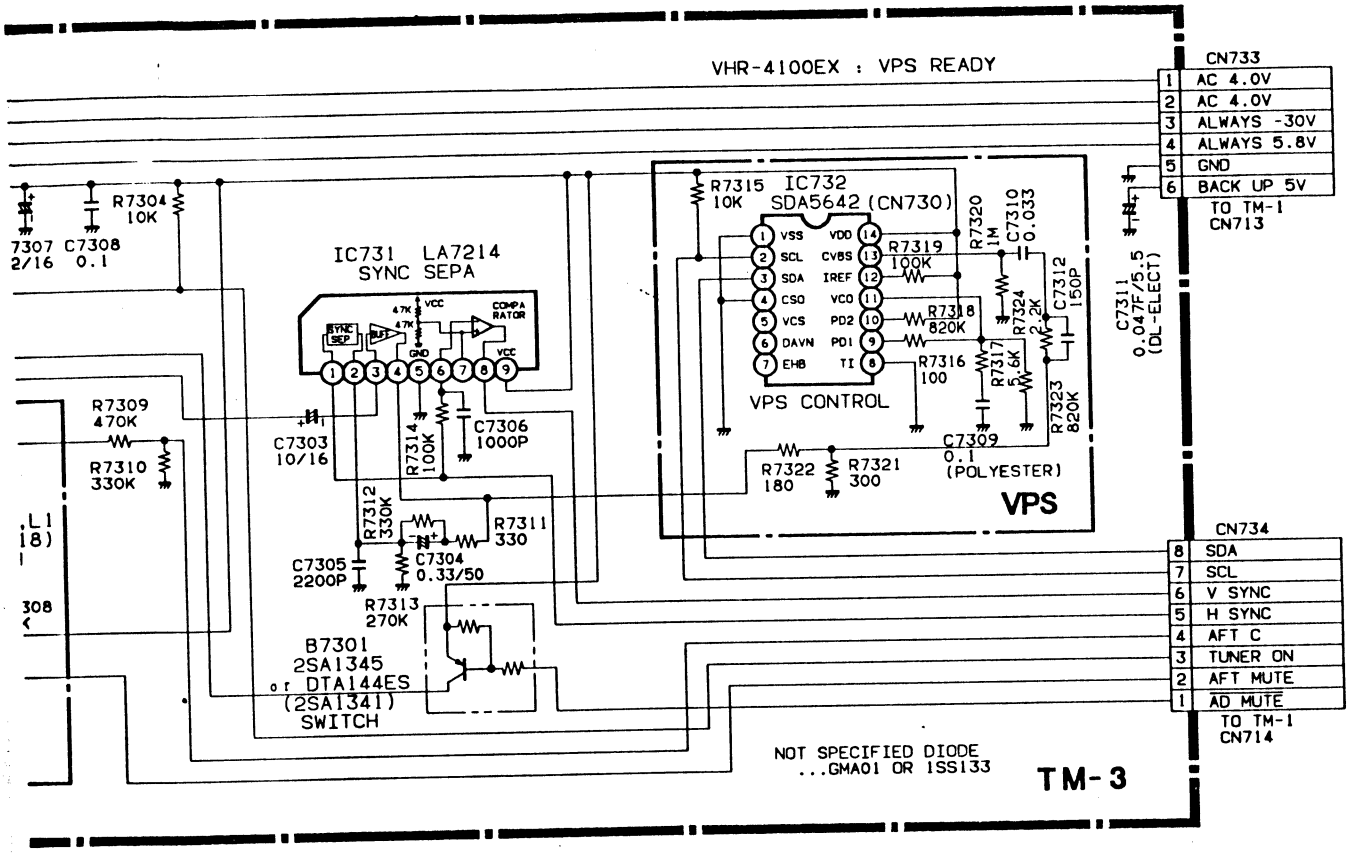
F04
F03
L03
T01
T02
L04
VIDEO
AFT
R22
D01
C25
Q04
C14
C12
C10
Z12
VR01 AGC
LOCATION



TV REMOCO
CN735

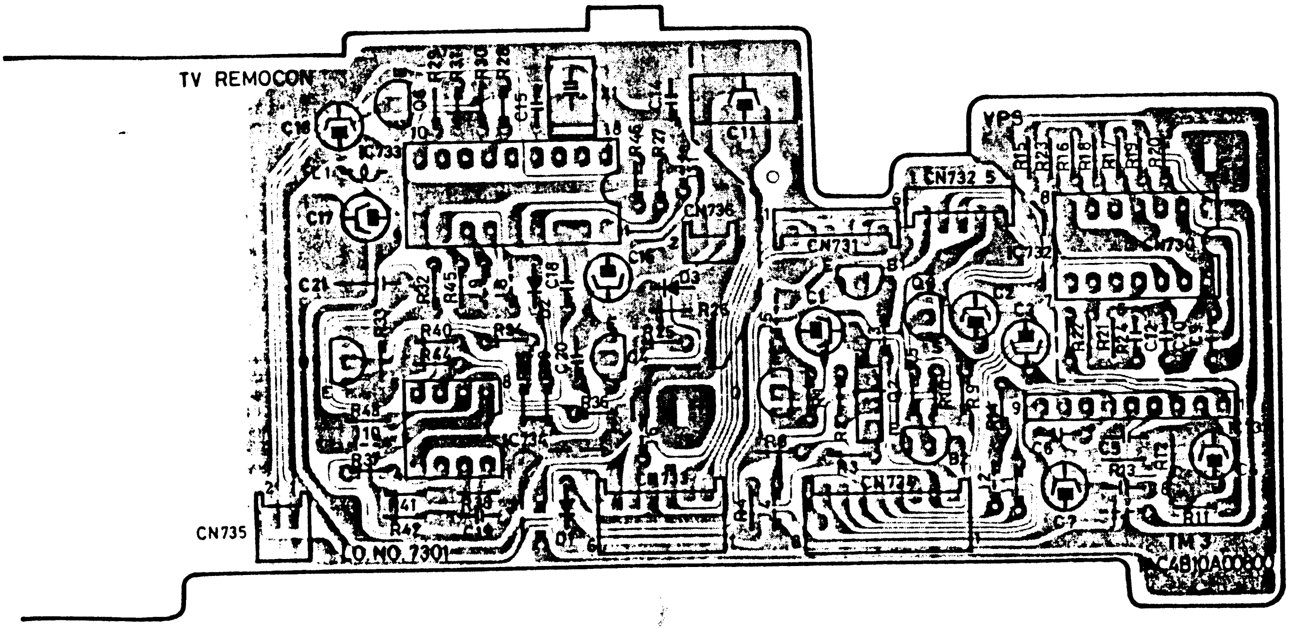
G

RCUIT (VHR-4100EX 1AC-0-B10A-00800) (VHR-4100EV, G 1AC-0-B10A-00801)


VHR-4100EX : VPS READY
CN733
1 AC 4.0V
2 AC 4.0V
3 ALWAYS -30V
4 ALWAYS 5.8V
5 GND
6 BACK UP 5V
TO TM-1 CN713
7307 2/16
C7308 0.1
R7304 10K
IC731 LA7214 SYNC SEPA
SYNC SEP
BUF
VCC
47K
47K
GND
COMPA RATOR
VCC
R7315 10K
IC732 SDA5642 (CN730)
VSS VDD
SCL CVBS
SDA IREF
CSO VCO
VCS PD2
DAVN PD1
EHB TI
R7320 1M
C7310 0.033
R7319 100K
R7318 820K
R7324 2.2K
C7312 150P
R7316 100
R7317 5.6K
R7323 820K
C7311 0.047F/5.5 (DL-ELECT)
VPS CONTROL
C7309 0.1 (POLYESTER)
R7322 180
R7321 300
VPS
R7309 470K
R7310 330K
C7303 10/16
R7314 100K
C7306 1000P
R7312 330K
R7311 330
C7305 2200P
C7304 0.33/50
R7313 270K
B7301 2SA1345 or DTA144ES (2SA1341) SWITCH
L1 18)
308
CN734
8 SDA
7 SCL
6 V SYNC
5 H SYNC
4 AFT C
3 TUNER ON
2 AFT MUTE
1 AD MUTE
TO TM-1 CN714
NOT SPECIFIED DIODE ...GMA01 OR 1SS133
TM-3

Ⓖ
VHR-4100EX
VHR-4100EV
VHR-4100G

TM-3 VPS, AFT P.C.B.


TV REMOCON
CN735
VPS
IC733
CN736
CN731
CN732
IC732
CN730
IC734
CN734
CN733
O.NO.7301
TM-3
C4B10A00800

16 17 18 19 20 21 22 2

H

K

J

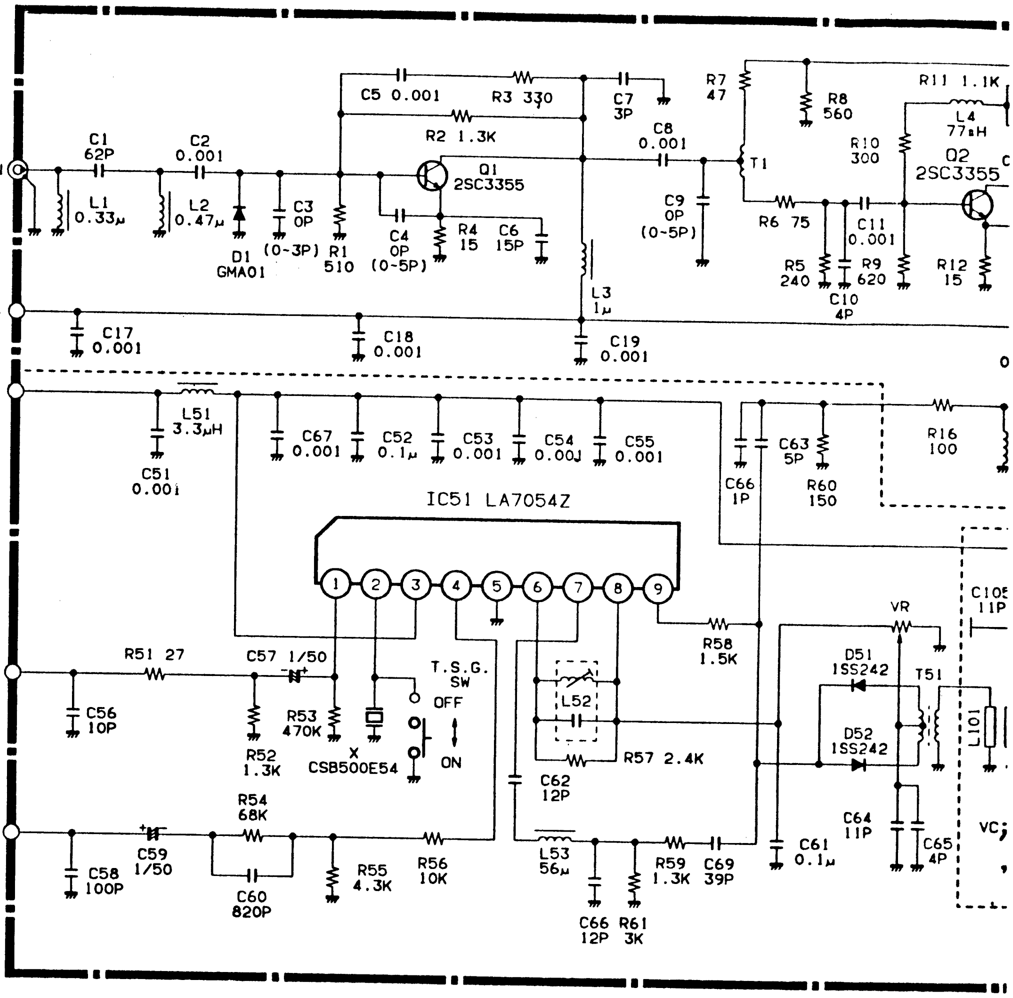
I

H

G

F

RF CONVERTER CIRCUIT (1AC-4-F2AG-000


ANT IN
BOOSTER+B (ALWAYS 5V)
MODULATOR+B (SWD 5V)
VD IN
AD IN
C1 62P
C2 0.001
L1 0.33μ
L2 0.47μ
D1 GMA01
C3 0P (0~3P)
R1 510
C4 0P (0~5P)
C5 0.001
R3 330
R2 1.3K
Q1 2SC3355
R4 15
C6 15P
C7 3P
C8 0.001
C9 0P (0~5P)
L3 1μ
R7 47
R8 560
T1
R6 75
R5 240
C10 4P
R9 620
C11 0.001
R10 300
R11 1.1K
L4 77nH
Q2 2SC3355
R12 15
C17 0.001
C18 0.001
C19 0.001
L51 3.3μH
C51 0.001
C67 0.001
C52 0.1μ
C53 0.001
C54 0.00J
C55 0.001
C66 1P
C63 5P
R60 150
R16 100
IC51 LA7054Z
R51 27
C56 10P
C57 1/50
R53 470K
R52 1.3K
X CSB500E54
T.S.G. SW
OFF
ON
L52
C62 12P
R57 2.4K
R58 1.5K
VR
C105 11P
D51 1SS242
D52 1SS242
T51
L101
C64 11P
C65 4P
C61 0.1μ
R54 68K
C59 1/50
C58 100P
C60 820P
R55 4.3K
R56 10K
L53 56μ
C66 12P
R61 3K
R59 1.3K
C69 39P
VC

Ⓗ
VHR-4100EX
VHR-4100EV
VHR-4100G

E

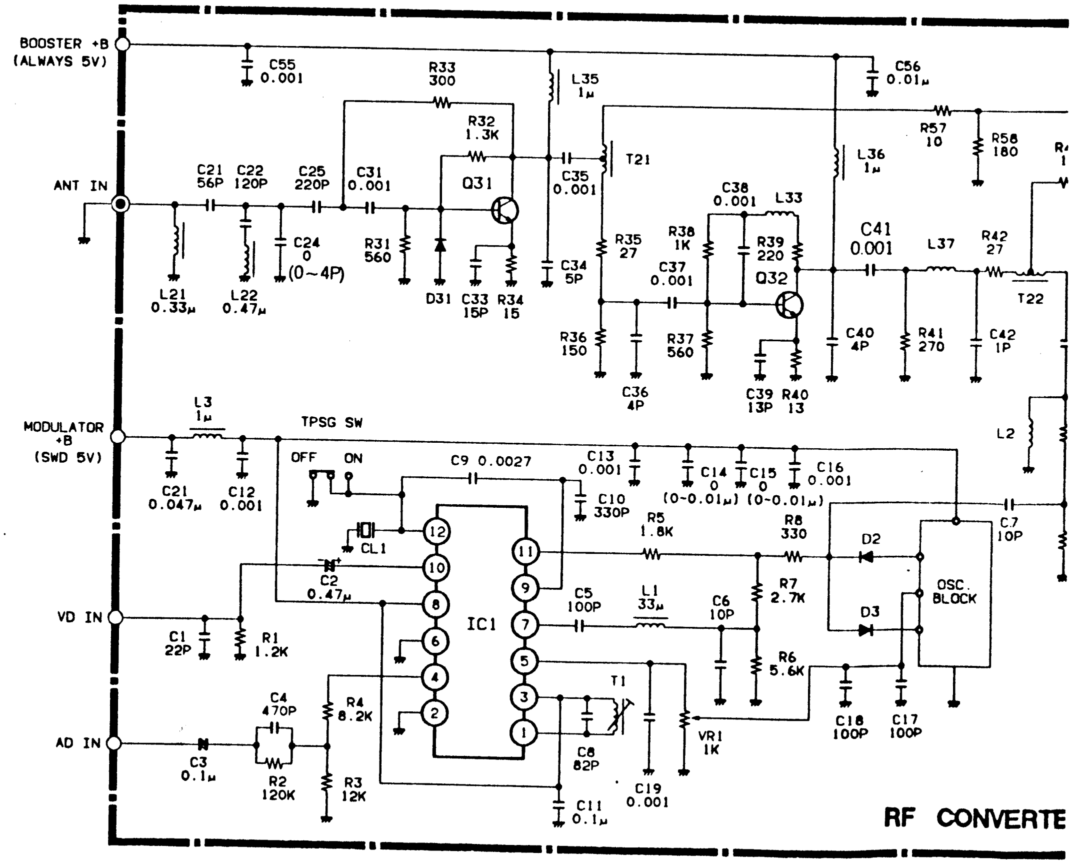
D

C

B

A

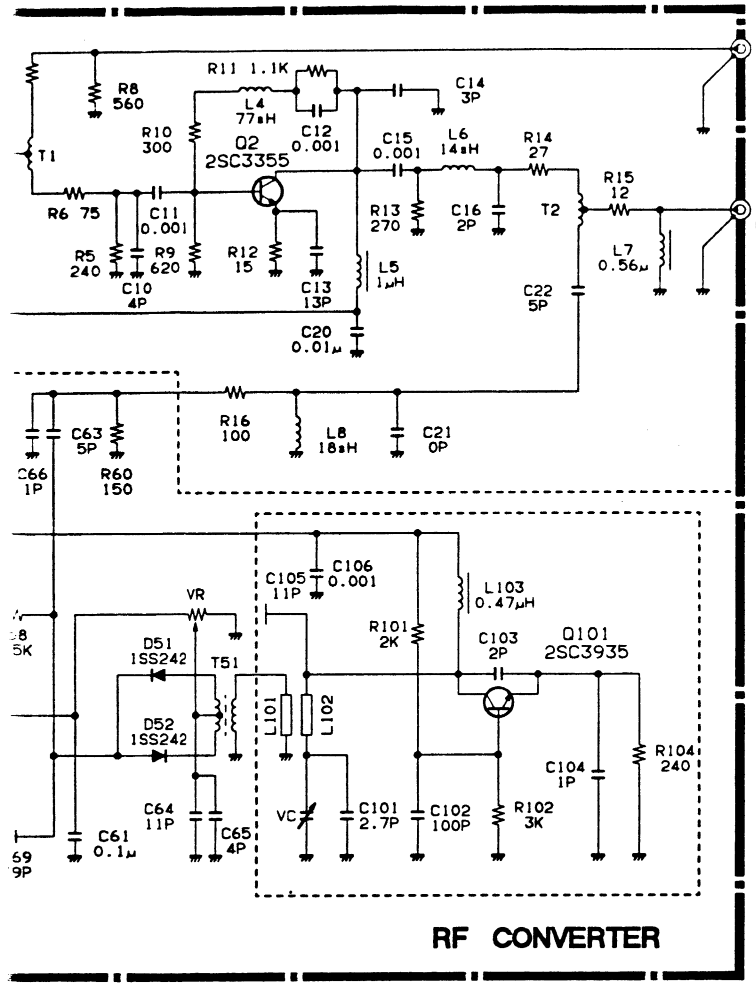
RF CONVERTER CIRCUIT (1AC-4-F2AG-0002


BOOSTER +B (ALWAYS 5V)
ANT IN
MODULATOR +B (SWD 5V)
VD IN
AD IN
C55 0.001
R33 300
L35 1μ
C56 0.01μ
R32 1.3K
T21
C21 56P
C22 120P
C25 220P
C31 0.001
Q31
C35 0.001
L21 0.33μ
L22 0.47μ
C24 0 (0~4P)
R31 560
D31
C33 15P
R34 15
C34 5P
R35 27
R36 150
C36 4P
C38 0.001
L33
R38 1K
R39 220
C37 0.001
Q32
R37 560
C39 13P
R40 13
L36 1μ
R57 10
R58 180
C41 0.001
L37
R42 27
T22
C40 4P
R41 270
C42 1P
L2
L3 1μ
TPSG SW
OFF
ON
C21 0.047μ
C12 0.001
C9 0.0027
C13 0.001
C14 0 (0~0.01μ)
C15 0 (0~0.01μ)
C16 0.001
C10 330P
CL1
C2 0.47μ
IC1
R5 1.8K
R8 330
D2
D3
OSC. BLOCK
C7 10P
C5 100P
L1 33μ
C6 10P
R7 2.7K
R6 5.6K
C18 100P
C17 100P
C1 22P
R1 1.2K
C4 470P
R4 8.2K
T1
C3 0.1μ
R2 120K
R3 12K
C8 82P
C19 0.001
VR1 1K
C11 0.1μ
RF CONVERTE

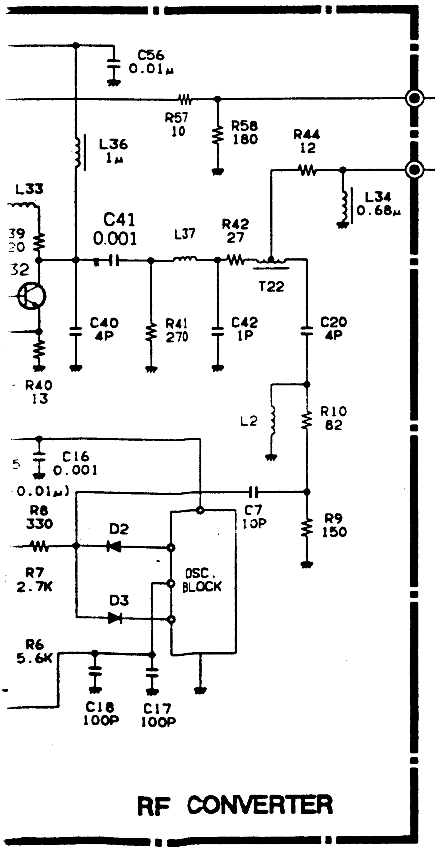
1 2 3 4 5 6 7 8

H

T (1AC-4-F2AG-00010)


TUNER OUT
ANT OUT
R8 560
R11 1.1K
L4 77nH
C14 3P
R10 300
Q2 2SC3355
C12 0.001
C15 0.001
L6 14nH
R14 27
R15 12
T1
T2
R6 75
C11 0.001
R5 240
R9 620
C10 4P
R12 15
R13 270
C16 2P
L7 0.56μ
C13 13P
L5 1μH
C22 5P
C20 0.01μ
R16 100
L8 18nH
C21 0P
C63 5P
R60 150
C66 1P
C105 11P
C106 0.001
L103 0.47μH
VR
R101 2K
C103 2P
Q101 2SC3935
D51 1SS242
T51
D52 1SS242
L101
L102
C104 1P
R104 240
C64 11P
C65 4P
C61 0.1μ
VC
C101 2.7P
C102 100P
R102 3K
RF CONVERTER

T (1AC-4-F2AG-00020)

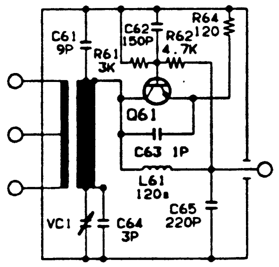

C56 0.01μ
TUNER OUT
R57 10
R58 180
R44 12
ANT OUT
L36 1μ
L34 0.68μ
L33
C41 0.001
L37
R42 27
T22
C40 4P
R41 270
C42 1P
C20 4P
R40 13
L2
R10 82
C16 0.001
C7 10P
R8 330
D2
R9 150
R7 2.7K
OSC. BLOCK
D3
R6 5.6K
C18 100P
C17 100P
RF CONVERTER

NOTE

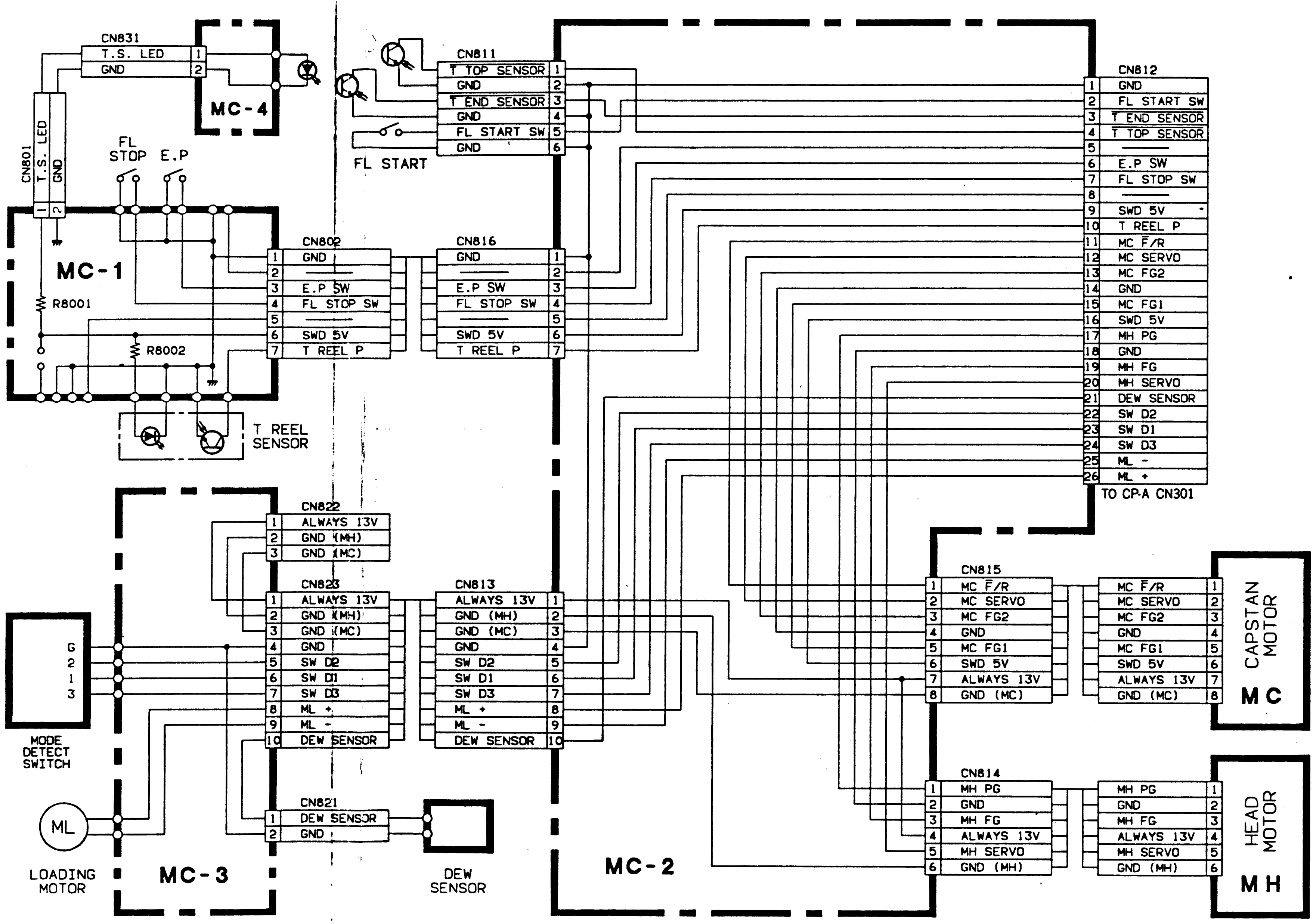
IC1 : AJ7080

Q61 : 2SC2480 OR EQUIVALENT
D2.D3 : HSM276 OR EQUIVALENT
D31 : 1SS133.1SS83 OR EQUIVALENT

OSC BLOCK


C61 9P
C62 150P
R64 120
R62 4.7K
R61 3K
Q61
C63 1P
L61 120n
+B
C65 220P
VC1
C64 3P

MECHANISM CONNECTION CIRCUIT (1AC-0-B11A-00100)

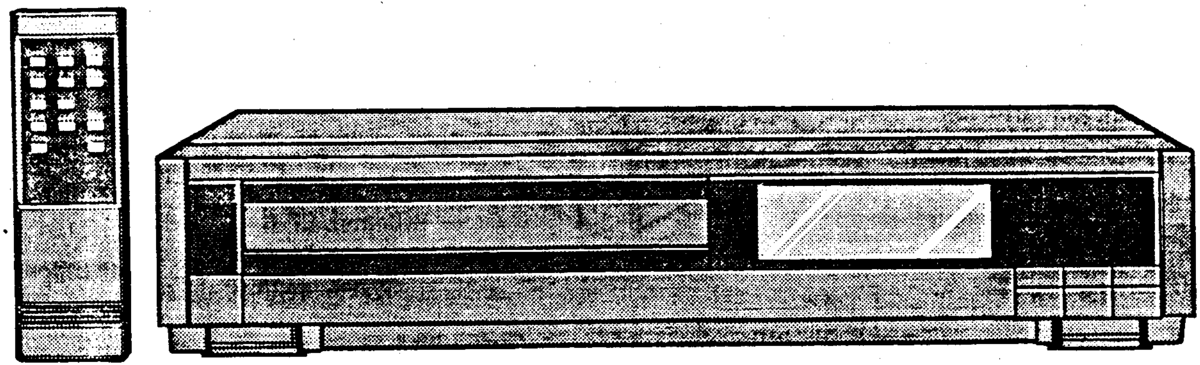

CN831
T.S. LED
GND
MC-4
CN801
T.S. LED
GND
FL STOP
E.P
MC-1
R8001
R8002
T REEL SENSOR
CN802
GND
E.P SW
FL STOP SW
SWD 5V
T REEL P
CN811
T TOP SENSOR
GND
T END SENSOR
GND
FL START SW
GND
FL START
CN816
GND
E.P SW
FL STOP SW
SWD 5V
T REEL P
CN812
GND
FL START SW
T END SENSOR
T TOP SENSOR
E.P SW
FL STOP SW
SWD 5V
T REEL P
MC F/R
MC SERVO
MC FG2
GND
MC FG1
SWD 5V
MH PG
GND
MH FG
MH SERVO
DEW SENSOR
SW D2
SW D1
SW D3
ML -
ML +
TO CP-A CN301
CN822
ALWAYS 13V
GND (MH)
GND (MC)
CN823
ALWAYS 13V
GND (MH)
GND (MC)
GND
SW D2
SW D1
SW D3
ML +
ML -
DEW SENSOR
CN813
ALWAYS 13V
GND (MH)
GND (MC)
GND
SW D2
SW D1
SW D3
ML +
ML -
DEW SENSOR
MODE DETECT SWITCH
G 2 1 3
ML
LOADING MOTOR
MC-3
CN821
DEW SENSOR
GND
DEW SENSOR
MC-2
CN815
MC F/R
MC SERVO
MC FG2
GND
MC FG1
SWD 5V
ALWAYS 13V
GND (MC)
CAPSTAN MOTOR
MC
CN814
MH PG
GND
MH FG
ALWAYS 13V
MH SERVO
GND (MH)
HEAD MOTOR
MH

SANYO

Service Manual

Colour Video Cassette Recorder

VHR-4100 Series



VHR-4100EX

VHS PAL HQ

Table of Contents

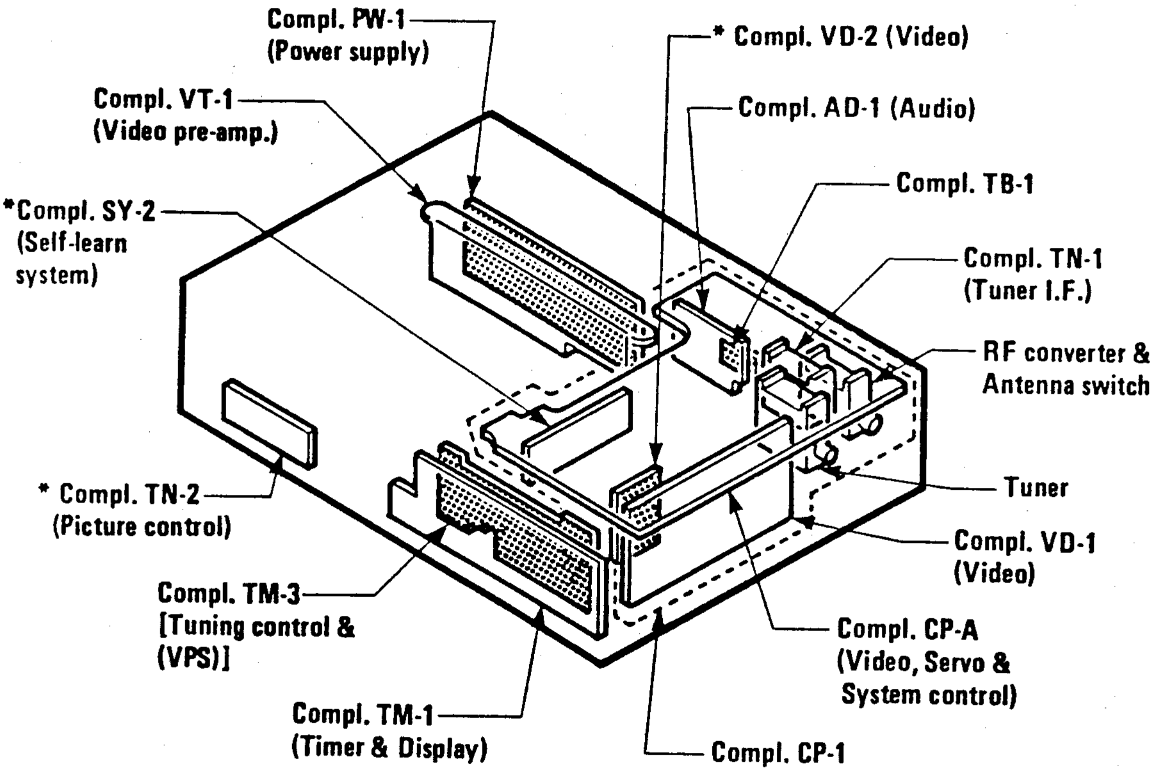
1. LOCATION OF THE MAIN BOARDS 1
2. ELECTRICAL ADJUSTMENTS .... 1 ~ 7

DP1/DP1L/DP2/DP2L Series

REFERENCE NO. WM-2234

1. LOCATION OF THE MAIN BOARDS

Compl. = Complete



Compl. PW-1 (Power supply)
Compl. VT-1 (Video pre-amp.)
*Compl. SY-2 (Self-learn system)
* Compl. TN-2 (Picture control)
Compl. TM-3 [Tuning control & (VPS)]
Compl. TM-1 (Timer & Display)
* Compl. VD-2 (Video)
Compl. AD-1 (Audio)
Compl. TB-1
Compl. TN-1 (Tuner I.F.)
RF converter & Antenna switch
Tuner
Compl. VD-1 (Video)
Compl. CP-A (Video, Servo & System control)
Compl. CP-1

* NOTE (1) : Compl. SY-2 and Compl. TN-2 are attached to the VHR-4300 series and VHR-4350 series models.

* NOTE (2) : Compl. VD-2 is attached to the VHR-4100 EX/EV/G/EE, VHR-4150EX/EV/G/EE, VHR-4300EX/EV/G/EE and VHR-4350EX/EV/G/EE models.

2. ELECTRICAL ADJUSTMENTS

2-1. PREPARATIONS

2-1-1. EQUIPMENTS

- Colour TV monitor
- Colour-bar generator (with RF and LINE OUTPUT)
- Audio frequency oscillator
- Attenuator
- Oscilloscope (dual trace; frequency response: 10MHz or more; probe: 10:1)
- Frequency counter (countable to 10MHz or higher)
- Digital voltmeter
- Alignment cassette (VHJ-0008) Colour bar 1KHz
- Alignment cassette (VHJ-0009) Monoscope 6KHz
- Alignment cassette (VHJ-0051) Check for D.O.C.
- Alignment cassette (VHJ-0023) PAL Monoscope 6KHz, PAL Colour-bar 1KHz, SECAM Colour-bar 1KHz, PAL RF Sweep MESECAM Colour-bar 1KHz, NTSC Colour-bar 1KHz.
- AC voltmeter
- In/output probes

2-1-2. SET-UP

Because the RF input signal is used for adjustment of circuits, connect the colour-bar generator to the ANT IN terminal of the VCR. The RF input signal is processed by the tuner and IF circuit. It is important that the video output signal of the IF circuit satisfy the items shown in figure. Connect the oscilloscope to the VIDEO OUTPUT terminal of the video circuit, and then check the video output signal.

- The amplitude of the sync signal should be approximately 0.3Vp-p.
- The amplitude of the video signal should be approximately 0.7Vp-p.
- While observing the oscilloscope or TV screen, make fine-tuning adjustments so that the colour burst amplitude is approximately 0.3Vp-p.
- Check to be sure that there is no spike noise in the sync part of the horizontal sync signal.

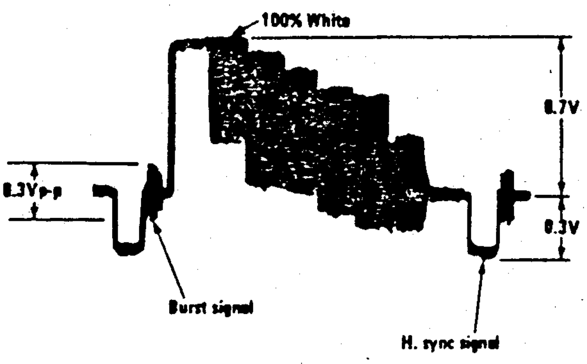
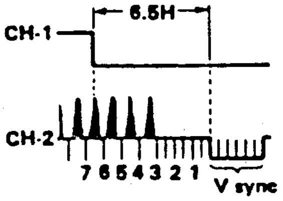
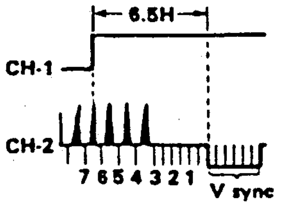
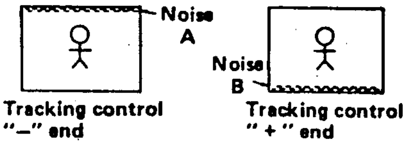


Fig. 2-2-1

2-2. SERVO CIRCUIT ADJUSTMENT ... Compl. CP-A

NOTE: Adjustment No. 4 is unnecessary for VHR-4100 series, VHR-4150 series and VHR-4350 series.

No.	Item	Input	Mode	Point	Location	Remark
1	CH-1 SWITCHING POSITION	Alignment cassette (VHJ-0009 or VHJ-0023)	PLAY	TP161 or CN161⑲ CN359① (trigger)	VR351	 1. Set the tracking control to the center position (on the display). 2. Adjust VR351 so that the phase of the leading edge of the vertical sync signal is delayed 6.5 ±0.5H from the fall of the CH-1 waveform.
2	CH-2 SWITCHING POSITION	Alignment cassette (VHJ-0009 or VHJ-0023)	PLAY	·TP161 or CN161⑲ CN359① (trigger)	VR351	 1. Set the tracking control to the center position. 2. Check that the phase of the leading edge of the vertical sync signal is delayed 6.5 ±0.5H from the rise of the CH-1 waveform. 3. If the phase difference is more than 0.5H, readjust VR351 to satisfactory value at CH-1 and CH-2.

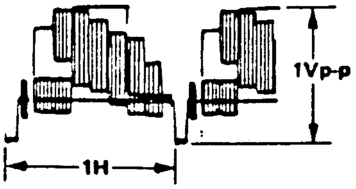
No.	Item	Input	Mode	Point	Location	Remark
3	STILL V-LOCK	Colour bar from Colour bar generator	REC ⬇ PLAY ⬇ STILL	TV screen	VR851 (Compl. TB-1)	1. Playback the recorded part, and put the VCR in the STILL mode. 2. Adjust VR851 so that the V jitter (very fine movement of the vertical sync) is minimized.
4	SLOW TRACKING (VHR-4300 series only)	Colour bar from Colour bar generator	REC ⬇ PLAY ⬇ SLOW	TV screen	VR362	 Noise A Noise B Tracking control "–" end Tracking control "+" end 1. Put the VCR in the REC mode (SP mode). (record at the middle of the cassette tape). 2. Playback the recorded part, and VCR in the SLOW mode by remote control. 3. Set the tracking control to the center position (on the display). 4. Turn VR362, and move the noise out of the TV screen, while watching to the screen. 5. The noise position at which noise begins to appear at the upper edge of the TV screen is A, when the tracking control to the "–" end. 6. The noise position at which noise begins to appear at the lower edge of the TV screen is B, when the tracking control to the "+" end. 7. Readjust VR362 so that the same level of noise A and noise B.

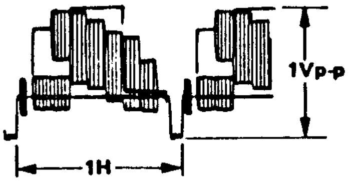
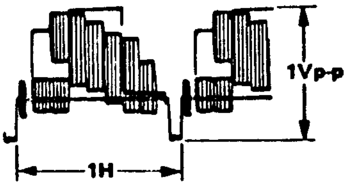
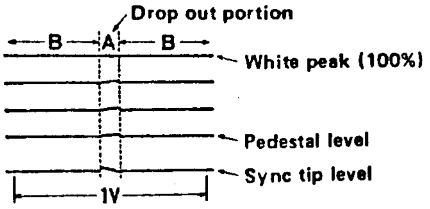
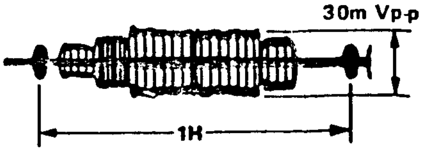
2-3. VIDEO CIRCUIT ADJUSTMENT ... Compl. VD-1 and Compl. VP-1

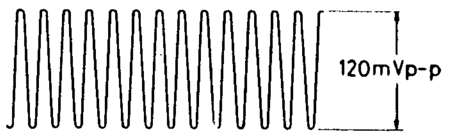
NOTE (1): When adjusting No. 1, No. 3 and No. 4 terminate VIDEO OUTPUT terminal (CN161 pin 19 or RCA terminal) at 75 ohms.

(2): To make this adjustment, alternately make the adjustments described in No. 2 and No. 3 below. Repeat this procedure until both adjustment values are satisfied.

(3): No-signal E-E mode is do not supply any signal to VIDEO INPUT terminal.

No.	Item	Input	Mode	Point	Location	Remark
1	E-E LEVEL	Colour bar from Colour bar generator	E-E	TP161 or CN161 ⑲ (Compl. CP-A)	VR104	 Adjust VR104 so that the level is 1.00 ±0.05 Vp-p.

No.	Item	Input	Mode	Point	Location	Remark
2	CARRIER SET	None	REC	TP102 or TP162 (Compl. CP-A)	VR101	1. Set the channel selector button to the "AV" position and put the VCR in the no-signal mode. 2. Adjust VR101 so that the frequency is 3.80 ±0.05 MHz.
3	DEVIATION	Colour bar from Colour bar generator	REC (Adjustment) ⬇ PLAY (Check)	TP102 or TP162 (Compl. CP-A)	VR102	 1. Playback the recorded part, and check that the level is 1.00 ±0.05 Vp-p. 2. If the level is not 1.00 ±0.05 Vp-p, adjust VR102, record and playback it until the value is satisfied.
4	PLAYBACK LEVEL	Alignment cassette (VHJ-0008 or VHJ-0023)	PLAY (Colour bar)	TP161 or CN161 ⑲ (Compl. CP-A)	VR103	 Adjust VR103 so that the level is 1.00 ±0.05 Vp-p.
5	VXO	Brank tape	PLAY	TP163 (Compl. CP-A)	VR121	Adjust VR121 so that the frequency is 4433619 ±20Hz.
6	CCD LEVEL	Alignment cassette (VHJ-0051)	PLAY	TP161 or CN161 ⑲ (Compl. CP-A)	VR111	 Drop out portion B A B White peak (100%) Pedestal level Sync tip level 1V 1. Set the horizontal scale of oscilloscope is 1 msec./div., and measuring with vertical period. 2. Adjust VR111 so that the drop out portion "A" of white peak (100%) and other portion "B" is same level.
7	CHROMINANCE SIGNAL RECORDING CURRENT	Colour bar from Colour bar generator	REC	CN183② (HOT) CN183① (GND) (Compl. VP-1)	VR182	 1. Turn VR181 all the way to the right, looking from the parts side. 2. Adjust VR182 so that the level is 30 ±2m Vp-p.

No.	Item	Input	Mode	Point	Location	Remark
8	LUMINANCE SIGNAL RECORDING CURRENT	None	REC	CN183② (HOT) CN183① (GND) (Compl. VP-1)	VR181	 1. Set the channel selector button to the "AV" position and put the VCR in the no-signal stop mode. 2. Adjust VR181 so that the level is 120 ±5m Vp-p.

2-4. AUDIO CIRCUIT ADJUSTMENT ... Compl. AD-1

NOTE (1): The VR201 and VR202 (on the Compl. AD-1) are able to adjust from the foil side of Compl. CP-A. (see Fig. 2-6-1)

NOTE (2): No-signal record mode is do not supply and signal to AUDIO INPUT terminal.

NOTE (3): Adjustment of No. 2 for the unit which used RCA pin jack for the audio output on the rear terminal board is not necessary.

NOTE (4): Adjustment of No. 3 for the unit which used 21 pin SCART for the audio output on the rear terminal board is not necessary.

No.	Item	Input	Mode	Point	Location	Remark
1	BIAS	None	REC	JP212 JP211 (GND) (Compl. CP-A)	VR201	1. Set the channel selector button to "AV" position and put the VCR in the no-signal record mode. 2. Adjust VR201 so that the level is 24mVrms.
2	PLAYBACK OUTPUT LEVEL NOTE (3)	Audio signal (1 KHz, −3.8 dBs) from Audio signal generator	REC ↓ PLAY	AUDIO OUT terminal CN161①	VR202	Adjust VR202 so that the recorded 1 kHz output level becomes −3.8 dBs in the PLAY mode.
3	PLAYBACK OUTPUT LEVEL NOTE (4)	Audio signal (1 KHz, −20 dBs) from Audio signal generator	REC ↓ PLAY	AUDIO OUT terminal	VR202	Adjust VR202 so that the recorded 1 KHz output level becomes −8 dBs in the PLAY mode.

2-5. TUNER IF CIRCUIT ADJUSTMENT ... Compl. TN-1

No.	Item	Input	Mode	Point	Location	Remark
1	RF AGC	TV broadcast	E-E	TV screen	VR6101	1. Remove the rear terminal board from Compl. CP-A. (see Fig. 2-6-1) 2. Turn VR6101 in the direction which causes snow to appear, then in the opposite direction until the snow just disappears.

2-6. TEST POINT & ADJUSTMENT LOCATION

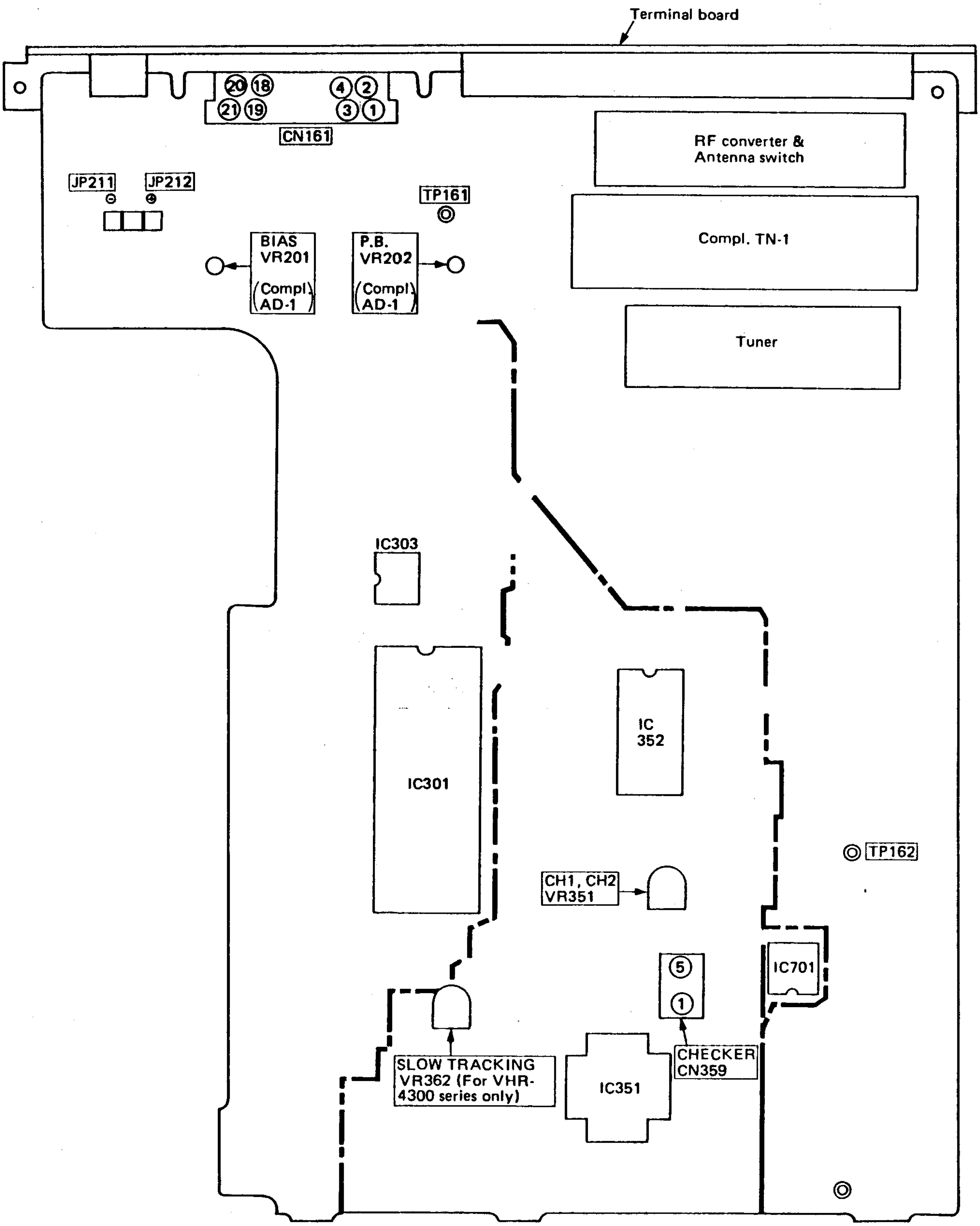

Terminal board
⑳ ⑱ ④ ②
㉑ ⑲ ③ ①
CN161
RF converter & Antenna switch
JP211
JP212
TP161
Compl. TN-1
BIAS VR201 (Compl AD-1)
P.B. VR202 (Compl AD-1)
Tuner
IC303
IC 352
IC301
TP162
CH1, CH2 VR351
⑤
①
IC701
SLOW TRACKING VR362 (For VHR-4300 series only)
IC351
CHECKER CN359

Fig. 2-6-1 Compl. CP-A (Foil side view)

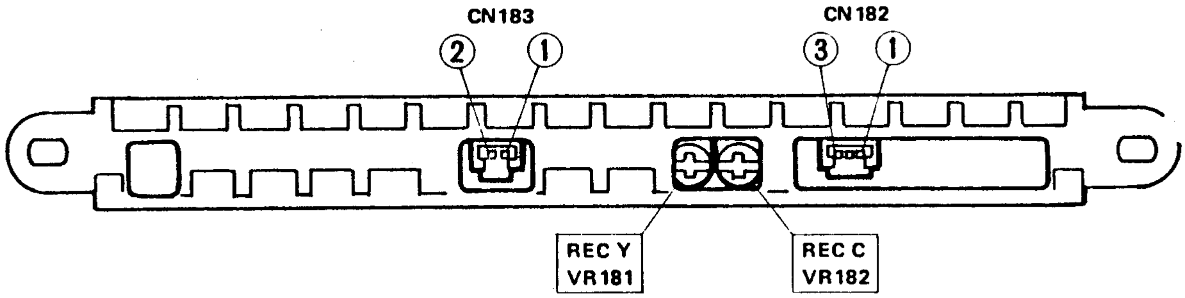

CN183
②
①
CN182
③
①
REC Y
VR181
REC C
VR182

Fig. 2-6-2 Compl. VP-1

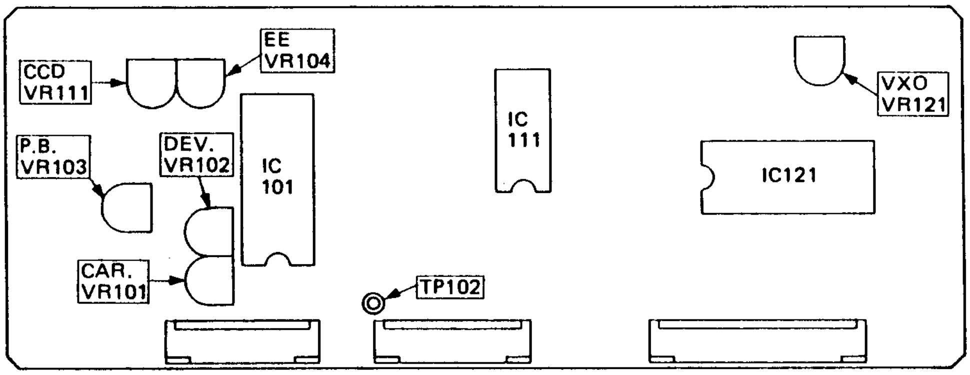

EE
VR104
CCD
VR111
P.B.
VR103
DEV.
VR102
IC
101
IC
111
VXO
VR121
IC121
CAR.
VR101
TP102

Fig. 2-6-3 Compl. VD-1 (Foil side view)

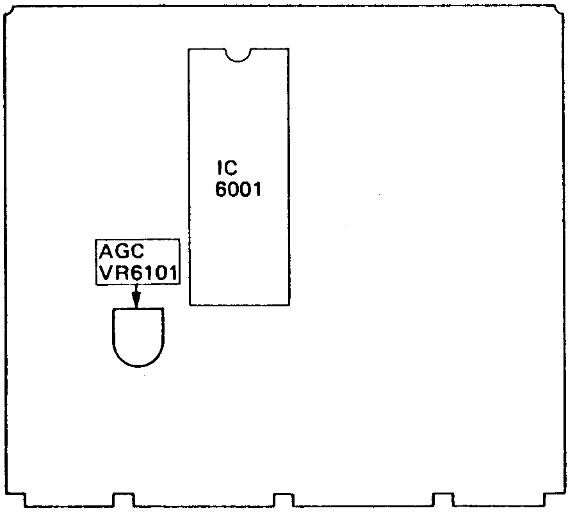

IC
6001
AGC
VR6101

Fig. 2-6-4 Compl. TN-1 (Parts side view)

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Osaka, Japan

A11300 Apr./'88/6000 HA Printed in Japan